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THOSE members of the Western Gas Association who failed to receive a copy of the souvenir book, entitled "The Gas, Coal and Iron Interests of Western Pennsylvania, and Gas Engineering Tables," can obtain it by forwarding 25 cents (for postage) to Mr. F. L. Slocum, Conestoga Building, Pittsburgh, Pa.

BRIEFLY TOLD.

THE PITTSBURGH MEETING OF THE COUNCIL OF THE AMERICAN GAS LIGHT ASSOCIATION.—On the evening of May 14th an important meeting of the Council of the American Gas Light Association was held in Pittsburgh, Pa.; the proceedings were carried out under the direction of Mr. Walton Clark, President of the Association, and of the Secretary, Mr. A. B. Slater, Jr. Those in attendance were Messrs. Walton Clark, A. B. Slater, Jr., Irvin Butterworth, W. R. Addicks, A. C. Humphreys, G. G. Ramsdell and A. E. Forstall. The minutes of the previous meeting having been read and approved, several applications for membership in the Association were passed upon affirmatively. The semi-annual report of the Secretary and Treasurer was then read and approved, following which came an examination of the list of papers so far presented for the Philadelphia meeting. The following Committee of Arrangements was appointed: F. H. Shelton (Chairman), W. K. Park, H. C. Adams, W. N. Milsted, C. D. Hauk, Jno. Gribbel, Walter Wood, G. W. Elkins and A. B. Slater, Jr. The Nominating Committee named was: Messrs. C. R. Collins (Chairman), E. C. Jones, Jas. Somerville, Fred. Egner and F. C. Sherman. The Finance Committee was then named: Messrs. C. J. R. Humphreys (Chairman), G. G. Ramsdell and A. E. Forstall. A discussion on the method and manner of carrying on the Association's *Quarterly* resulted in the fixing of the price thereof at $1 per single copy, and the number that one member may receive was increased to four; in other words, that a member can purchase four copies in addition to the one which he now takes free because of his membership. Another agreement in this respect was that each writer of a paper, to be read at the Association meetings, shall receive a dozen copies of the *Quarterly* in which his paper is published. The unpaid dues of one retired member were remitted, and the resignation of that member was accepted. The Secretary was authorized to keep on hand a sufficient number of the Association's badges, that the same might be ready for new members who asked for them. The proceedings were brought to a close after a general discussion of the affairs of the Association, during which many things for its advancement were talked over, but in respect of any of which no ultimate decision was reached.

OBITUARY NOTE, MR. WILLIAM C. ADAMS.—We regret to have to report the death of Mr. William C. Adams, Superintendent of the Richmond (Va.) City Gas Works, whose translation was marked by suddenness, on the night of Sunday, May 19th. Deceased was a native Virginian, having been born in Midlothian (which to this time is only a mere post village, of Chesterfield county, even though it is but 13 miles west of the place where his best days in the gas industry were spent—Richmond), in 1841, and early in life, because of the stern need that one must make his own way in the world, served an apprenticeship in the shops of the Richmond & Danville Railroad. He was attentive and retentive in and about his duties, which means much for a youngster who passed his best receptive days in the midst of the most turbulent scenes of the war of the Rebellion, for many and stirring were the war scenes of the early sixties along the line of the tracks of the Richmond and Danville system, even though its length was less than 151 miles. In 1866 he accepted a subordinate's position with the Richmond City

Gas Works (which at the time was under the domination of a "military administration"), and in 1869 was named to the place of foreman of the "Lower Works," in which he continued until 1886, when he was appointed Superintendent of the plant. The gas makers of the country fully appreciate the difficulties involved in the superintending of gas plants that are operated by the ordinary commonsense regulations and practices which prevail in works under private control, and so understanding they will all the more comprehend the difficulties and adversities that beset those charged with the direction of enterprises whose nominal heads are named by the people—as the result of "popular elections." Mr. Adams had an unusually difficult task of it, to so steer his course that, while the various lighting committees were assured of their saving importance in gas affairs in Virginia's biggest city, the gas consumers were properly served; but his tact and engineering skill were sufficient to placate the politicians, at least, while his abilities as an engineer were undiminished—in any event, amongst those of the craft who appreciated the circumstances of his post. To sum it up, when his labors were ended the output of the Richmond plant was 200 per cent. in excess of what it was when he took charge of its affairs, despite the fact that a political management denied him the appropriations for works' enlargement that even the most parsimonious private or corporation management would have given without the asking. This is said in justice to deceased, for had he had a tithe of the encouragement that private enterprise would give, the Richmond works would not be the parody which they are to-day. Mr. Adams was a member of the American Gas Light Association, having been elected to membership therein at the meeting held in Washington, October, 1884, and his allegiance to it was of the type which a loyal man always gives to that which he prizes. His wife was a Miss Purks, who survives him, as do five children, one of whom (B. A. Adams) is in charge of the "Upper" station of the Richmond works. The funeral services were celebrated in the First Presbyterian Church, the Rev. J. Calvin Stewart, of the Church of the Covenant, officiating, the notable attending mourners being a delegation of the gas works' employees. Captain William Henry White, of this city, was an honorary pall bearer.

THE END AT PITTSBURGH.—Little remains to be said over the Western Association's meeting for '95, save to repeat our verdict of last week that it was useful, valuable and fraternal. No balks were made, no pledges were unredeemed, no hopes were unrealized in respect of its assembly. The papers were epitomes of the authors' experiences and their fair knowledge of that which they had in hand. Even though Mr. Highlands and Mr. Miller were somewhat pronounced in their views, and very much differed in their conclusions anent their subjects from the beliefs held regarding them by at least "a fair minority" of others, they had no hesitation in putting themselves squarely on record; and a fair disputant is immeasurably better to cross words with than an argumentative parrier. The outing time was very enjoyable, although it might have been better had there been fewer amateur artillerists on board the "Carrier." The meeting was in every sense a success, and its crowning glories were: The indefatigable and perfectly successful efforts of the executives respecting the carrying on of the routine; the alertness of the gentlemen who took charge of the visitors (in this connection it is not unfair to specifically name Messrs. Slocum and Henderson), and the election of Mr. Littleton to the Presidency.

AT the annual meeting of the New Britain (Conn.) Gas Light Company, held on the 18th inst., the following officers were elected: James H. Eddy, President, and A. J. Sloper, Secretary and Treasurer. Mr. Eddy succeeds the late Hon. George M. Landers, who was one of the incorporators of the Company and its President for many years and until his demise on March 28th last. Mr. Sloper succeeds the late Augustus P. Collins, who was also one of the original incorporators of the Company and for many years a member of the Board of Directors, besides being its Secretary and Treasurer. Mr. Collins' death occurred on April 21st, 1895.

NOTES.—Receiver Moran, of the Consolidated Gas and Electric Light Company, of Port Chester, N. Y., has notified the gas consumers that those whose meters do not show a consumption of 500 cubic feet of gas per month will be obliged to pay $1 for each 30 days that they retain a meter.——Mrs. K. R. Custer has been non-suited in her prayer for damages against the Philadelphia gas works. Her husband was killed by an explosion of gas in the Point Breeze station on February 27th, 1895. The defence proved that Custer had been specifically ordered to keep away from the part of the works in which the explosion occurred. ——The proprietors of the Atlantic City (N. J.) Gas and Water Company have declared a dividend at the rate of 8 per cent. per annum.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 727.]

EIGHTEENTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD AT PITTSBURGH, PA., May 15, 16 and 17, 1895.

FIRST DAY—MORNING SESSION.

Mr. Thompson presented the following report:

REPORT OF THE AUDITING COMMITTEE.

To the Western Gas Association: Your Auditing Committee hereby report that they have examined the books of the Treasurer, and compared the past financial year with the amounts shown in the cash books; finding all correct and properly footed, with the reported balance in bank to the Association's credit. Respectfully submitted,

GEO. T. THOMPSON,
W. M. EATON,
JAS. FORBES,
} Auditing Committee.

LETTERS AND TELEGRAMS OF REGRET.

The Secretary announced that he had received letters or telegrams from the following named gentlemen, regretting their inability to acknowledge in person the Association's invitation to participate in the proceedings:

Col. J. H. Armington,	Mr. J. Gimper,	Mr. C. H. Nettleton,
Col. F. H. Benson,	Mr. G. W. Graeff,	Mr. W. H. Pearson,
Mr. Fred. Egner,	Gen. Jno. P. Harbison,	Col. Jos. R. Thomas,
Mr. F. H. Eichbaum,	Mr. E. C. Jones,	Mr. A. C. Wood,
		Mr. W. A. Wood.

APPOINTMENT OF SPECIAL COMMITTEES.

The President then announced the memembership of the following Special Committees:

On Nominations—Messrs. J. B. Howard, Geo. G. Ramsdell, B. E. Chollar, Jas Ferrier and A. F. Nash.

On Next Place of Meeting—Messrs. E. G. Cowdery, J. W. Stratton, Peter Young, W. M. Eaton and George E. Woods.

On Memorials—Messrs. Irvin Butterworth, Jas. Forbes and C. H. Evans.

On Final Resolutions—Messrs. Jas. Somerville, J. A. Faux and W. B. Sellers.

READING THE PAPERS.

The President then introduced Mr. S. M. Highlands, of Clinton, Ia., who read the following paper on

INCANDESCENT GAS LIGHTING.

The subject of incandescent gas lighting, and its relation to the gas industry, is a question which would seem to warrant very careful consideration.

The Western Gas Association has been proverbial for its conservatism, but the individuals composing it have been as wide awake and progressive as those of any other industry of similar magnitude. Several years ago it was rank heresy to mention water gas at our meetings, but the officers of the various companies here represented investigated the merits of the new method of gas making, and the result is that nearly 90 per cent. of the gas made in the West is water gas, and they are again turning their attention to new methods which would seem to promise even better results.

With the advent of a properly constructed gas stove, they were quick to see its merits, and that its proper introduction meant not only largely increased sales of gas, but fortunes for the manufacturers, and to-day the gas company is the exception that does not carry a large line of stoves in a finely equipped show room, with men whose sole duty is to push their sale and use, as far as possible; and none of those who have earnestly tried the introduction of gas stoves have been disappointed.

The gas engine has not met with quite so cordial a reception. After a pretty thorough investigation of its merits, they have found its high cost, low consumption of gas and limited field, would not permit of returns sufficiently remunerative to justify their handling them except as an incident, and to supply the wants of a customer who really wanted one.

With the advent of electric lighting came a new element of uncertainty, but a thorough investigation demonstrated two things. First, that there was actually a demand for electric light, and it was here to stay; second, that there was a fair margin of profit in the business, and the gas companies were the proper parties to handle it. To-day no less than 248 gas companies in the Central and Western States are operating electric light plants; and when such companies as the Laclede, of St. Louis, the Cincinnati, the Louisville, St. Paul, Rochester and others engage in it as extensively as they have done, it demonstrates that the

business actually has its merits; and so extensive has been the investment by Western gas companies in the electric light business, that this Association might, with propriety, be called the Western Gas and Electrical Association.

The foregoing are simply cited as illustrative of the fact that gas men are, as a rule, fully alive to their interests, and ever ready to take up and adopt any appliance or method that will add to their business and consequent profits, and equally able to discriminate against any appliance that would be either detrimental or not sufficiently profitable to warrant their taking up and adopting it either for their own use or the use of their customers.

With the advent of the incandescent gas lamp, we are met with two startling propositions. The first is the introduction of a gas burner which promises to give an efficiency of 300 to 400 per cent. as compared to those we have been accustomed to. The second is the introduction of a gas appliance through agencies entirely independent of the gas companies.

It is not necessary here to enter into a technical discussion of the Welsbach burner, as it is familiar to all of you, and it is to be presumed that most, if not all of you, have experimented enough with it to be pretty well satisfied in your own minds, both as to its merits and weaknesses.

We, as gas men, have labored long and earnestly to devise means whereby our sales of gas could be increased.

All our reductions in the prices of gas—and they have been many—have had this one object in view, and when these reductions have failed to increase the sales sufficiently to increase the gross revenue the reductions have been regarded as a business mistake. Our old coal gas benches and apparatus have been discarded and thrown into the scrap pile to make room for improved methods whereby we could make a better gas, and thereby increase our sales.

The history of the gas business up to the present time has been one of continued growth and prosperity, giving ample proof that we had successfully studied and managed the interests entrusted to our care. Now shall we, as custodians of these vast interests, adopt methods and appliances whose sole merit is that they will decrease our business and damage the interests which we are expected to protect? The sole recommendation of the incandescent gas lamp is that it will furnish a large volume of light with a small consumption of gas. No one ever pretended that the light is beautiful or pleasant, or the lamp ornamental. On the contrary, it is conceded by all that the color of the light is nothing but a ghastly glare, offensive and painful to the eye. No one ever thought that the rays from the electric arc were pleasing, or that it was fit for our houses, churches or clubs, and that it could but be barely tolerated in the large stores; yet it is a pleasing light as compared with the incandescent gas lamp with which we are most familiar. The only recommendation the incandescent electric light ever had was its convenience and the beauty and softness of the light, and while admittedly the most expensive light, it has merits enough to make it the most wonderful success this world has ever witnessed. Never before has any new appliance met with such a wide and extensive demand. The short space of 15 years has been sufficient to thoroughly distribute it over the entire world, and the factories for making the lamps alone are numbered by the hundreds, with individual capacities of turning out many thousand lamps per day; and it is safe to assume that no less than half a million lamps per day are required to supply the demand for this most beautiful and expensive light. This in itself is sufficient proof that low price is not absolutely necessary to success. What else than low price of light has the incandescent gas lamp to recommend it? Possibly to use as a competitor of the electric light; but if so, to whose advantage? Certainly not to that of the gas company, if the old gas customers are also to be permitted to use it. Were this burner to be generally introduced at once to the present line of gas customers it would, without doubt, curtail our output for lighting purposes by at least 50 per cent., and the consequences of this wholesale reduction of the volume of our business you can picture to yourselves. As managers, how many of you would care to face the proposition? True, the burner has held a limited success in street lighting in some European cities, but its chances of displacing the electric arc lamp in American cities are so remote that it is not worth consideration.

If anything else were needed in this new and much advertised lamp to cause gas men to view it with alarm, it is found in the methods adopted for its introduction. In the majority of cities special agents are appointed for its sale who have no connection with the gas company, and any orders the gas company may give for lamps are entirely ignored.

The only possible interest these agents may have in the matter is to sell the greatest possible number of burners with the least exertion. His easiest and best customers are found amongst the largest gas customers—those whose bills are the greatest. Little if any effort is made by them to sell to users of electric light, and none at all to those who are using oil. Dwelling houses and stores that are not using gas are left severely alone, as not being worth bothering with.

So far as my investigation goes, those gas companies who have successfully met electric competition, and fattened under it, now find their consumption falling off because of the use of the incandescent gas lamp. Their number of consumers may be slightly increasing, but the increase in the number of consumers is more than offset by the reduction in the bills of their larger customers. The hardest thing in this connection the gas man has to contend with is that he cannot use this burner in working up business among the smaller houses, for the reasons: First, he cannot get the burners; and, second, they are too expensive for this class of customers to buy, and they are not able to give them the care necessary for their maintenance. Possibly some day we may be able to secure an incandescent gas lamp whose rays will be more pleasing, whose price will be reasonable, and which gas men can buy and sell along with their gas stoves and other appliances to whomsoever will buy. And when that day comes it may be to our interest to see them introduced; but to-day the electric light and carbon oil lamp are not half so dangerous to the gas man as is the incandescent gas lamp.

Discussion.

Mr. Walton Clark—I want to be the first to congratulate Mr. Highlands upon the courage he has shown in presenting this paper. He has shown not only that he has convictions, but that he has the full courage of his convictions, when he can stand up in the face of this display and say what he has said of the Welsbach light. While he has been reading I have made a few notes which, with your permission, I will read. Higher candle power means more light per cubic foot of gas. Whether this higher candle power results from richer gas, or from improvement in the conditions attending the combustion of the gas, the result is the same—an increase in the amount of light obtained by the consumer, for every dollar paid over the desk of the cashier into the cash drawer of the gas company, or a reduction in the number of dollars paid for the service previously enjoyed. It has been generally believed that this has resulted in good to the gas company. It is, I believe, considered an axiom by political economists that any improvement in the way of cheapening the cost of production results in the extension of sales, and increases the prosperity of the supplier. Certainly gas companies have had no reason to regret the displacement of old forms of burners by the checked batswing and the Argand, because with the improved service has come increased consumption of gas, and with the increased consumption has come increased prosperity. Why Mr. Highlands should anticipate a reversal of the laws of trade and the experience of gas companies in the case of the Welsbach light he has not made clear. In the absence of any demonstration of the discovery of new laws, we must believe that the old laws will prevail, and that the introduction of the Welsbach light will enable gas companies to hold their present desirable financial position. To be consistent, it seems to me that Mr. Highlands should oppose the introduction of gas stoves, or the use of any gas saving appliances; he must refuse to supply new burners, or to aid his consumers in getting from the gas they burn the greatest possible amount of light. He knows, as his paper shows, that this course is not dictated by wisdom; and so, I think, we must look elsewhere to find the animus of his paper. Possibly it may be found in the following sentence: "If anything else were needed in this new and much advertised lamp to cause gas men to view it with alarm, it is found in the methods adopted for its introduction. In the majority of of cities, special agents are appointed for its sale, who have no connection with the gas company, and any orders the gas company may give for lamps are entirely ignored." As to the truth of the statement that, "in the majority of cities special agents are appointed," I do not know. Doubtless if special agents are appointed, and the gas company is not intrusted with the sale of the lamps it is because the experience of the Welsbach Company has been that it could not push its sales through the gas companies. I believe that Mr. Highlands himself has previously put himself on record as having opposed the introduction of the Welsbach light because it burned too little gas, and that the Welsbach Company therefore did not give Mr. Highlands, in the city which he represents, the agency for the sale of the Welsbach light. As to that I think it probable some one connected with the Welsbach Company might have something to say. There was certainly a temporary reduction in the amount of gas sold in some of the European cities immediately following the introduction of the improved light; but that those

reductions were permanent I do not at all believe. My experience in the companies with which I am associated shows that it is not permanent. On the contrary, it shows that the introduction of the Welsbach light increases the sales of gas. From the entirely inadequate compensation that comes to a "gas-house hustler," I have, in the course of 20 years, been able to save a few hundred dollars, which I have invested in gas stocks. I desire particularly that in the cities in which I am interested in gas property the Welsbach light should be pushed to the fullest extent. Mr. Highlands himself gives evidence that increase of sales must follow the introduction of Welsbach lights. He says, referring to the agents for the Welsbach light: "His easiest and best customers are found amongst the largest gas consumers. Those whose bills are the greatest." Now it is certain that the largest consumers are those who are to go to the use of the electric light. That certainly is the experience of the gas companies with which I am connected. He says again, referring to the small gas consumers: "They are too expensive for this class of customers to buy, and they are not able to give them the care necessary to their maintenance." Therefore, I think that, from Mr. Highlands' argument, we must draw the inevitable conclusion that the Welsbach light can be placed with gas consumers who are liable to use the electric light, and that it cannot be placed with gas consumers who are not liable to use the electric light. This would seem to indicate that the Welsbach light is an admirable instrument in the hands of a gas company to cut the electric light out of the field, without at all interfering with the consumption of the great majority of its consumers—the small consumers. Mr. Highlands says, further, that "little, if any, effort is made by them to sell to users of electric light, and none at all to those who are using oil." He complains that the Welsbach Company does not go into the street and seek to extend the use of gas among the people who are living along the line of mains without introducing gas into their houses. But that is certainly not the business of the introducer of gas burners or appliances; it is the business of the local gas company, and if the superintendent of that company has properly looked after this matter there is no room for the Welsbach agent, or any other agent, to do anything more in that line.

Mr. Ramsdell—I should dislike very much to see this paper go on our records without the Association making a very earnest protest against it. I am entirely unfamiliar with Mr. Highlands' situation, and with the arrangements which he may or may not have with the Welsbach Company, which have been intimated upon this floor. But my experience with these lamps is so entirely different from his, as is the experience of about every gas man with whom I have had any conversation on the subject, that I am very confident we cannot afford to have such a statement go forth without an earnest protest. I do not propose to take his statements up *seriatim;* but, in the first place, I must say I think some of his propositions are entirely untenable, as based, not only upon my own experience, but upon the experience of almost any of us. Taking our own experience as a basis (and I have no doubt it corresponds with that of most of the members), I may say that when we first began to use the Welsbach light I made pretty careful tests and records of its effect. The summary of those results shows that about one-third of the new consumption comes from oil consumers, about one-third from incandescent electric light consumers, and the balance from our own gas consumers; and I think I am safe in saying we have not a company where we have not increased our business—our sales of gas—by the introduction of the Welsbach light. Another thing worthy consideration is, I have found quite a strong desire for the Welsbach light for street lighting. I think the position taken on this point by Mr. Highlands is entirely wrong. We have closed three contracts for street lighting with Welsbach lights that I do not think we could have obtained in any other way. We have another contract pending, where the competition is from arc light, and there we have stationed lamps to show that three of these Welsbach lamps will afford as good illumination for all practical purposes as an arc light. We expect also to obtain that contract. I therefore think this Association should go upon record as protesting against the sentiments of that paper.

Mr. Highlands—I do not believe that any gentleman here present will accuse me of attempting to air a personal grievance. I have none. I think it well to hear both sides of the case, and will give an illustration. I will simply say this: You will probably remember that, in a paper I read a year ago before this Association, I said I had made the experiment of using Welsbach lights to drive out a municipal electric lighting plant in what was the adjoining town of Lyons, but which now constitutes the 6th and 7th wards of Clinton. The results of some of that work I have here. As some of you will probably remember, this is the place where we succeeded in driving the city electric light plant out by using the Welsbach light. In 1893 we had 135 meters set in this place, and were selling 2,407,500 cubic feet of gas, or an average of 17,830 feet per year per meter. In the year 1894 we were supplying all the stores with gas, nearly all of which are using incandescent gas lamps, and in the meantime a considerable number of private houses put in Welsbach lights on the fixtures where they would be used the most, so that here we have an ideal place to show the advantage of the introduction of the incandescent gas light. In 1894 we had 160 meters set in this district, through which was used 2,248,200 feet, an average loss per meter of 3,749, or a total loss of 599,840 feet; or, viewed in another light, we had driven out the electric light and increased our investment over $500, and lost the sale of 159,300 feet of gas in the experiment, and had increased the number of consumers by 25. I have one more statement as to the benefits derived from the introduction of the incandescent gas light. We have a club room in our city which used 81,400 feet of gas from January 1 to May 1, 1894. On January 1, 1895, we replaced the burners commonly used there with the Welsbach burners, and from that time to May 1, 1895, they used 35,400 feet—a loss to us of 46,000 feet, or over 50 per cent. on one customer in six months.

Mr. Humphreys—I do not care to say anything in answer to Mr. Highlands' paper in defence of the Welsbach light, because I think such action on my part would be unnecessary; but I would like to enter my protest against what seems to me to be the spirit of the paper in a general way. Anything which we can do, no matter what the views we may hold about it at first may be, and no matter how frightened we may be as to the ultimate result—if there is anything that we can do to give our consumers more light for a given expenditure of money, it is our duty to do it. (Applause.) But I think we are entirely safe in going further than that, and that we can say in this case that "Honesty is the best policy." We have invariably found, so far, that where we have taken that course we have in the long run found profit from it. And I do not have the slightest hesitation in saying I believe that in the future, as in the past, we will find the introduction of this or of any other appliance which tends to give the consumer more light for a given expenditure of money will be to the advantage of the gas companies we represent. (Applause.)

Mr. Jenkins—I fully agree with what has been said by those who preceded me, that this Association does not want to be put on record as opposing any device which may reduce the cost of our light to our consumers. We cannot afford to do that. We would have every newspaper in the country taking that question up and hammering us right and left. In fact they have said it against us enough times already. I want to say, however, there is one thing in Mr. Highlands' paper that meets my approval in this respect: I think the gas companies should, in every possible case, be the agent in introducing the Welsbach light. I know of a number of cases where special agents in towns have introduced them, with no interest whatever in the matter except to sell the burners. I can cite one city in the South where, in one season, 1,800 burners were sold, but in less than six months nearly one-half of those burners were out of use, simply because the agent had gone and there was no one there to take care of the burners. That is a serious matter for our consideration. I was in a barber shop in another Southern city last week, in which there were three Welsbach lights and four ordinary gas burners, and I can assure you that one ordinary gas burner would have given as much light as did those three Welsbach lights, because of the condition in which they were. That is because an outside agent introduced those lights. We have pushed the Welsbach lights in Columbus, Ga., to the best of our ability, and without regard to who wanted them. We have sold a number of them there, and the percentage of sales has been about as follows: For displacement of gas burners, 52 per cent.; for displacement of electric lights, 35 per cent.; the remaining 13 per cent. is divided among consumers of oil and new consumers. We have increased our sales more than 12 per cent. over last year. (Applause.) I want to say another thing in the line of what Mr. Ramsdell said about street lighting. We made an experiment of about three months' duration with street lighting with the Welsbach, and I am satisfied, from that experiment, that in a town of ordinary size we can in a short time get back the best part of the street lighting, and at a figure that will pay us. (Applause.)

Mr. Howard—The experiences of Mr. Highlands and myself are entirely different with regard to the use of the Welsbach burner. I find that by the introduction of the Welsbach I have been able to knock out an electric light plant entirely. So I think it has been a good business. (Applause.) I find also that in respect to smaller consumers my experience differs from his. For instance, one of our butchers had two oil lamps in his store. I spoke to him about his seeming need of a better light, one which would prevent the odor of kerosene hanging round his beef after he had tended to his lamps. I also said that I

would give him a burner which would yield him more light than did those two oil lamps, and at no greater cost. I made an agreement with him and put in a Welsbach light. His place is so small and his light so good that he has since said that if he could not get another he would not take $25 for that burner. In the Associations of Europe they have looked with favor upon the manufacturers of burners, and have given cognizance to the effect which is produced by recognizing merit. Mr. Sugg and Mr. Bray have been recognized by several Associations there with regard to their efforts in the perfection and introduction of improved gas burners. I think this Western Gas Association could do credit to itself by authorizing our Secretary to send a letter to Dr. Auer von Welsbach, stating that we honor him for the ingenuity and skill displayed in evolving a burner which is one of the best things given to the gas industry to avail itself of for many years. I offer that as a motion. (Seconded by Mr. Corscot.)

Mr. Butterworth—I would like to make a few remarks on Mr. Howard's motion. I wish simply to say it seems to me, in view of the fact that the Welsbach burner in its present improved form has been in use in this country for so short a time, that it is rather early to expect the returns to be coming in as to its effect upon the gas business; and especially so in view of the further fact that the makers have been unable to supply the demand. But we are nevertheless already receiving such returns as indicate how things are going. I have here a letter received from the Secretary of a gas company in a Western town of about 40,000 people, from which I will read a few lines—the letter itself was not written upon the subject of the Welsbach burner, but ends with the following reference to it: "The introduction of the Welsbach burner has worked a marvelous revolution in our business. Since its use our output has increased at least 50 per cent., mainly due to the Welsbach burner. The gas companies should raise a lasting monument to its inventor."

Mr. Harper—I live in a town in which, in the last few months, over 900 Welsbach lights have been placed, and to-day the output is greater than at any time in its previous history. The agency for the burner, for certain political reasons, is not held by the gas company; but he gets all possible encouragement from us, and the gas company does quite a large share of his advertising. One point which Mr. Highlands makes I wish to refer to. He says, "The chance of the Welsbach burner displacing the electric arc lamps in American cities is so remote that it is not worth consideration." In Altoona, Pa., this chance is worth consideration, because we have been able to displace 35 arc lights which were used for general store lighting; and in no individual case more than three arc lights were replaced in one store. This shows the unquestioned ability of the Welsbach light to take the place of arc lamps for general store lighting.

Mr. Ramsdell—I would like to add one thing which I omitted to state when I spoke before. Mr. Highlands says that "no one ever pretended that the light is beautiful or pleasant, or the lamp ornamental; on the contrary, it is conceded by all that the color of the light is nothing but a ghastly glare, offensive and painful to the eye." If I understand Mr. Highlands aright, when he prepared his paper he had not seen the Welsbach light as it is shown here in this hotel. Therefore, I would suggest that that part of his paper (if it can be done in accordance with our rules) be eliminated, if Mr. Highlands is willing.

Mr. Lynn—I would like to detail some experience with regard to the introduction of the incandescent gas light in Detroit. To begin with, I will have to take issue with Mr. Jenkins with regard to the gas company handling this burner. In Detroit the burner is handled by the Gas Appliances Exchange, the Gas Company giving all the encouragement it can to the introduction of these lights. In the last 15 months they have placed a total of 5,641 incandescent gas lamps of the Welsbach type. These have replaced 3,720 electric lights, 1,206 oil lamps and 715 ordinary gas burners. Allowing 3 feet of gas for each burner, this will make a total consumption for the 5,641 lamps of 14,778 feet; and a decrease on the 715 gas burners displaced of 2,145 feet, or a net gain of 12,633 feet per hour to the credit of the Welsbach burner in our city. I also wish to take issue with Mr. Highlands with regard to the percentage of water gas made in the West. I do not know where he got his statistics showing that 90 per cent. of the gas made in the West was water gas; for, according to the latest statistics available, there is only 53 per cent. of water gas made in the West. In regard to getting consumers, and increasing the consumption of gas by the introduction of Welsbach lights, let me instance a case in point, in a block very close to our gas works—it was a block in which not one foot of gas had been used. The block was taken up by only small stores—druggist, butcher, grocery, etc.—and by the introduction, free of charge, and at the instance of the Gas Company, of two Welsbach burners into that drug store, we now have about 40 Welsbach burners going in that block. Every store in it is now lighted by gas. I am satisfied that our gas consumption has been increased very materially by the introduction of the Welsbach lamp; and I for one protest against the indorsement by this Association of Mr. Highlands' paper condemning the Welsbach light, or any other lamp that cheapens to the consumer the cost of gas.

Mr. Miller—This subject has been pretty well covered, but I would like to emphasize a point made by Mr. Howard with regard to the comparative cost of the Welsbach light and kerosene. Our main competitor, without any question, is oil. There are but very few houses in any town that do not burn oil in some way, and there are probably three or four houses that burn oil exclusively to every one that burns gas. The price of oil is going up every day, and it is now very high. A gallon of oil will give in light, with an ordinary lamp in good order, the equivalent of about 850 candle hours; with a high candle power lamp, or one whose efficiency is higher, this would probably be raised to 1,200. If you allow 20 candles to the foot of gas (which is fair), we get 20,000 candle hours to 1,000 feet of gas; which is equivalent to 23 gallons of oil burned in an ordinary lamp, or 17 gallons of oil burned in a high candle power lamp. At the present prices of oil and gas, allowing for the breakage of Welsbach mantles, and a large allowance for chimneys, but not allowing for the labor of cleaning oil lamps, you will find that it is cheaper to light by the Welsbach lamps than it is to light with oil.

Mr. Eaton—In regard to the utility of the Welsbach burner, I want to give the members of the Association some figures from my town—Jackson, Mich. One store I have in mind used three arc lights at a fixed charge of $2.50 per lamp; the current was furnished to these lamps at 2 cents per hour, making the cost of running the three lamps from $15 to $18 per month. They were displaced by 22, possibly 24, Welsbach lamps. They used them during the month of April at an expense of $2.50. Of course, for the month before that the cost would have been more; it must have been $3.50. I have in view another store (a drug store) that was paying an average of $25 for lighting; it is not now paying to exceed $7 per month, and the proprietors are better satisfied with the present than they were with their old method of lighting. In every case where we have come against the electric light we have lighted the stores with the Welsbach with greater satisfaction, and at an expense running from 25 to 40 per cent. of the former electric light bills—and we have as good an electric light company as there is in the country, which is operated by good business men, who put up their works in good shape and furnish a good light.

Mr. Darrah—I do not believe there is any other incandescent gas light in existence to compete with the Welsbach light; but the trouble with the Welsbach light to-day is the deficiency in the mantle. I have had some experience in putting them on. I have discovered that some mantles will not last 24 hours, although I have had others that at the end of six months were seemingly as good as when put on. But where you find one mantle of the latter kind you will find ten others which will not last as long. I believe it is the only way you can compete with electricity. Where I have put them on they knock the incandescent electric light right out; it is nowhere in comparison with the Welsbach. I think it would be better if each gas company would get the direct agency for the Welsbach from the original company. By doing so they can handle these lights, keep up the necessary repairs at all times, and not be subject to an agent, who will go and come only when it pleases him. An agent may leave a city or town whenever it pleases him, and then there is no one left in that locality to handle the light. Further, if the burners must pass through three agencies before they reach the gas company, there is then no profit in handling them. If they come directly from the company, then the gas company can keep up all repairs and furnish all the lights at less expense. It is the only light that can compete with the electric, and it beats it everywhere if you have the same candle power in the incandescent electric light that there is in the Welsbach incandescent. It takes a very large incandescent electric light to give you a 60-candle power light in a dwelling or store room, and the arc light is the only light that can compete with the Welsbach. Even then, for street purposes, three Welsbach lights in combination in one lamp will give you almost as much as any ordinary arc lamp for street lighting. My suggestion to my friends here is that if they can get the direct agency for the Welsbach they can make a success of it wherever it is introduced, because then they can get all the material with which to keep up the lamps at less expense than they can through an agency.

Mr. Nash—One point that has not been touched on yet is the standpoint of the user—whether as electric light man or gas man. I would

like to ask Mr. Highlands whether he is in the electric light business as well as in the gas business.

Mr. Highlands—I am.

Mr. Nash—That is what I thought.

Mr. Odiorne—I would like to ask in connection with this whether any member has introduced this Welsbach light for street lighting, and has had it in use in that way for any considerable length of time.

Mr. Gwynn—I do not think there is any question but that different localities are differently affected by the introduction of the Welsbach burner. I think, as Mr. Highlands says, that in some localities where it is put in competition with the flat-flame burner, the introduction of the Welsbach will cut down the consumption temporarily. But if the business is properly worked up there is no question that in the course of time you can get back the former consumption, and with it a large increase. I know that in our city of Steubenville, O., when we commenced to use the burner the consumption was greatly decreased at the start, owing to the fact that a great many of our consumers used flat-flame burners, and that we displaced very few oil lamps right at the start; but in the course of 60 or 90 days we commenced working on the oil lamps, and found that the consumption commenced to go up. To-day it is very little behind what it was six months ago, and is still gradually increasing, and in a few months I think there will be an increase of business over what we formerly had. I think there is no question that in many localities you can light with the Welsbach for less money than you can with large coal oil lamps. The greatest effect with us has been in the displacement of the incandescent electric lights. We have displaced more incandescent lights with the Welsbach than we have coal oil lamps, but the latter have been and are also being displaced daily.

Mr. Clark—I want to answer Mr. Odiorne's question as to the use of the Welsbach for street lighting. We have a number of places where the Welsbach is used for street lighting, but not more than a few dozen have been in over a year. At the start we figured for six renewals per year. We thought that so many would be broken by the boys throwing stones through the lanterns that we might have to renew an average of six times per year. But I now believe that three renewals per year are sufficient to figure on, unless the lamps are located in a particularly bad district; by that I mean where there is a good deal of malicious mischief. We have made one contract under which we hope to place 350 lamps. There are only 200 in now under that contract, and we base our expectation of 350 on the satisfaction generally expressed with the lighting by the Welsbach lamps. We expect that more of the arc lights will be displaced, and that we shall get the lighting of the city with the Welsbach. This is not an experiment that we are making at our own cost, but we are getting a very fair profit on the light. We are getting as much as we were expecting to get, before the days of the incandescent and arc light, from the open flame street light. It is in on its merits, and the extension of the light in that city depends upon the satisfaction it gives to the people. Our experience warrants us in believing that we will get 150 more lights in that town, and the Welsbach is there largely displacing the electric arc light.

Mr. Highlands—It seems to me that I am away behind the procession in this matter. In looking over this audience I see many faces that I have seen before at previous conventions, at some of which we heard Mr. Starr's advocacy of large burners, and plenty of them. It seems to me that while I have been following in his footsteps the procession has gone by, and I do not even get into the band-wagon. One point which I think has been overlooked is that I spoke from the standpoint of a small gas works. There are in the United States over 1,000 gas plants, and there are 45 cities in the United States with a population of 75,000 and over. A great majority of the gas works are in the small towns, where the output will of necessity be limited because the number of consumers is limited, and a great many of them cover the entire territory, and already have nearly every possible customer. Viewing it from their standpoint, replacing their burners, which now have an average consumption of six feet per hour, with burners that average, as nearly as I can get at it, only 2.66 feet per hour, it certainly looks to me like bankruptcy for those small companies. Where they will get the revenue to pay the expenses of the existing works or to extend the works already established is a point that troubles me.

Mr. Butterworth—Is not three-fourths of the lighting in your town done with oil at present? And is there not a chance to work on that?

Mr. Highlands—I will say yes to that.

Mr. McDonald—No doubt the subject is of very great interest to all the members of the Association. I had thought of putting this matter to them in a little different light from what it has been put this morning. It seems to me that it does not admit of argument. Supposing some gentleman in this room should say that he had discovered how the cost of manufacturing gas could be reduced 50 per cent! You would welcome him with ardor, and there would not be a dissenting voice. Now what has happened? We have a burner furnished us which does that identical thing—it reduces the cost of gas. Therefore, I think it is a thing that ought to be welcomed by every gas man. The gas consumed in that burner costs 50 per cent. less than it would cost to produce the same amount of light from the same gas when consumed in any other burner in use; and it practically amounts to identically the same thing as if you reduced the cost of your gas 50 per cent. It makes a reduction in the cost of gas—a reduction not at the works, but a reduction at the point of ignition, which is the place where you want the cost of gas reduced. Therefore, it seems to me there is hardly a chance for argument on the question of the utility of this burner.

Mr. J. W. Stratton—I only want to say a word in endorsement of the sentiment expressed by Mr. Ramsdell. It seems to me it would be exceedingly inconsistent for this Association to endorse this paper—a paper which would be largely copied into the electric light journals, and which would give so much comfort to our competitors in the lighting business. Still, I agree with him in some points. I think it would be better for the gas companies, and I think it would be to the interest of the Welsbach people if the gas companies would handle the burners, and in that way have a deeper interest in keeping up repairs. The item of repairs is a very considerable one in connection with this burner. The mantle itself is not what I think it should be, or could be. However, that is a matter which will, no doubt, eventually take better shape. A Welsbach burner with a broken chimney or broken mantle is a great annoyance to the consumer; and if he cannot get repairs easily and speedily, he will condemn the burner and may condemn all lighting by gas. I think that is one of the strongest factors against the incandescent burner. The electrical men are quick to perceive this; and why we, as a Gas Association, should be called upon to give them such exceeding comfort, I, for one, cannot understand.

Mr. Clark—Perhaps the Welsbach light has had more than its share of attention to-day; but I do not want to let Mr. Highlands' statement, that the small gas companies would suffer from the introduction of the Welsbach light, go unchallenged. Anything that will cheapen the cost of gas light will certainly extend the use of gas. It is in the small towns that the consumption of gas per capita is small. It is in the small towns, therefore, that there is the greatest room for an extension in the use of gas. In large cities the people will burn gas at practically whatever cost. In New York city, for instance, the rate of gas per capita is, I am informed, 7,000 cubic feet per year. I do not believe there is in the country a town as small as Clinton, Iowa, which sells more than 3,000 feet per capita, and I doubt if one-third of them sell more than 1,200 feet per capita. It is, therefore, in these small towns that there is afforded the best chance for extension in the use of gas; and it is in these towns that the cheapening of the gas light to the consumer will result in the increased demand for gas. In that way, it seems to me, the use of the Welsbach burner will directly benefit the small gas companies. I know that, in our experience, we do not find that the Welsbach light hurts us in the small towns; and we try to push it in the small places as well as in the large.

Mr. Howard—I hope that nothing will be done to prevent the paper of Mr. Highlands, and the discussion thereon, being published with the other papers. I should exceedingly regret the suppression of that paper. I am not afraid of having the electrical papers publish it. I wish they would publish the entire thing. I think that the Welsbach Company are under a debt of gratitude to Mr. Highlands for his paper, and I hope they will see it. I trust nothing will be done to prevent its publication. I am confident that the paper will prove of benefit to the gas interest.

Mr. Evans—I believe that this Association as a body are satisfied that Mr. Highlands in presenting this paper to the Association acted in entire good faith, and that his paper is really a statement of his own experience. As I understood him he is in the gas lighting business and also in the electric light business; and I have no doubt that in the preparation and presentation of this paper every word was written in good faith. I, therefore, move that the thanks of the Association be extended to him for his labor in preparing it.

The President—There is already a motion before the house. It has been moved by Mr. Howard, and seconded, that the thanks of the Western Gas Association be extended to Herr Auer von Welsbach for his discovery and production of the gas burner; and that the Secretary transmit this expression of the Association to him. (Carried.)

Mr. Highlands—As to the disposition of the paper I have read, I have this to say. I wrote the paper against my protest, and did all I could

to get out of it. I stand by the assertions and statements made as to the Welsbach burner. There is no retraction at all. Whatever disposition the Association sees fit to make of the paper is a matter of no consequence to me. If you think it best for the interests of all to suppress the paper instead of publishing it, you have my hearty consent to do so. If by writing a paper in the line I have done I have succeeded in bringing about a discussion which will be of benefit to us all—as I think this will prove—then I shall have accomplished the very purpose I had in view. (Applause.)

Mr. Humphreys—I second Mr. Evans' motion thanking Mr. Highlands for his paper. Unquestionably the paper was prepared in good faith; and we certainly wish to show no discourtesy to him in view of that fact. Furthermore, we can at the same time congratulate ourselves on the presentation of such a paper. I agree with Mr. Howard that it cannot possibly do the gas business any harm, accompanied as it must be by a statement as to the discussion and by the resolution which has been passed. If we were to eliminate it from the minutes it might be taken advantage of by the electrical papers, and then no explanation of our action could set us straight again.

Mr. Thompson—I think Mr. Highlands and Mr. Howard are in error in thinking that there was any suggestion as to the suppression of the paper. Mr. Ramsdell suggested the elimination of one sentence—that regarding the "ghastly glare" of the Welsbach light; that in view of Mr. Highlands' remark while reading the paper that he had not previously seen the light as exhibited in this hotel, it was suggested that that sentence be withdrawn. But there was no question about suppressing the paper itself.

Mr. Howard—Yes, there was.

Mr. Thompson—I think we may congratulate ourselves upon having a member who has the courage of his convictions; for it would be a great pity that any one holding views possibly not in accord with those of the majority should hesitate to express them. (Applause.)

The President—You have heard the motion of Mr. Evans, that the thanks of the Association be extended to Mr. Highlands for his paper. (Carried.)

The Association took a recess until 1:30 P.M.

FIRST DAY—AFTERNOON SESSION.

The Association met at 2 P.M., and the President introduced Mr. Alten S. Miller, of New York, who read the following paper on

METAL GASHOLDER TANKS.

Gentlemen: I am at a loss to understand why your Secretary should have requested me to write a paper on the subject of metal gasholder tanks, as my experience on the subject has been so limited as to make it of very little value. Though I have just witnessed the erection of the largest metal tank in this country, my experience in the use of such tanks has been limited to one tank during 12 months. Under the circumstances, it has been necessary in compiling this paper to depend mainly upon the experience of others.

When it becomes necessary to build a new holder, it is usually desirable to select the site independently of the nature of the ground, and great inconvenience is often caused by the latter being such as to prevent the construction of a masonry tank. Even though the ground appears firm, and test holes show no unusual formation, when excavation is begun, springs, quicksands and boulders are often found that swell the cost of the tank far beyond the original estimate. You all know of cases where, owing to unforseen difficulties, the cost of masonry tanks has largely exceeded the original estimate, and where it has been impossible to get a permanently sound tank. Such being the case, if without extra cost or inconvenience these risks can be avoided, no one would hesitate to avoid them; so it remains only to be seen whether extra cost or inconvenience would be encountered.

First, as to Cost.—If steel is used, all excavation is saved, as all that is necessary is to smooth off the top of the ground to a level surface. As the steel sides are much lighter than masonry walls, and the weight of the bottom is so small as to be scarcely worth considering, no more concrete will be necessary under a steel tank than is used ordinarily in the bottom and under the walls of a masonry tank. As a matter of fact, less is necessary for the former tank, but for ease and comparison we will assume that the same is used in each case. The inlet and outlet connections will be shortened a few feet, and less excavation will be needed for them in the case of the steel tank. The difference, however, is so small that it is fair to assume them to be the same in each case.

In the case of the steel tank a steel pier will be used in the center in place of masonry, but beyond this the crown supports will be the same in each case. This leaves us the masonry and excavation to compare to the iron and the cost of erection.

Excavation will cost all the way from 25 to 80 cents a yard, depending upon the size of the tank and the facilities for disposing of the excavated material. It is possible to go below the former figure under the best conditions in very large tanks, and it is easy to run above the latter in the smaller sizes. Often quicksands and soft earth will cause slides so that the excavation grows to be half as large again as was planned. If much rock is encountered, the cost is very much increased, especially if the stone has no particular value after it is removed. If the earth is firm a saving can be made by leaving a mound in the center, but this cannot be done unless the ground is reasonably solid. Cases have occurred where the weight of the walls and the water around the base of the mound when the tank was being filled have caused the wet mud in the mound to flow upward and break through the top. As the concrete cover is depended upon to hold the water, as soon as it is broken the tank begins to leak. Often it is necessary to pump the tank out for repairs before a holder is put in use.

The cost of masonry will vary greatly with locality, but not so much perhaps as the cost of excavation. It will vary from $10 to $18 a yard, a mason laying from 1,000 to 1,500 bricks a day, in mortar made of one part by volume of Portland cement and three parts sand. The cost of stone will vary very widely, so that it is hardly possible to give a figure that would be of value outside a very small locality.

Herewith I give the cost of several masonry and steel tanks of the same size, omitting such work as is common to both:

Masonry Tank 102 Feet by 20 Feet 10 Inches.

Excavation, 34.5 cents a yard	$2,268 73
Masonry, $11.52 a yard	10,797 76
Plastering	455 03
Base stones and coping	996 14
Landing stones	114 75
Back filling	1,084 16
Tarring tank	149 09
Sundries	174 13
	$16,039 79

The cost of these items in a similar masonry tank at another point was as follows:

Excavation and back filling	$2,475 00
Masonry, $14.13 a yard	13,795 00
Base stones and coping	1,674 00
Landing stones	78 00
Sundries	155 00
	$18,177 00

A tank this size in steel, not including the cost of foundation, but including column supports, landing blocks, painting and parts corresponding to the masonry tanks given, cost $11,500. This would represent a saving of $4,540 in one case and $6,677 in the other.

Cost of an 82-Ft. by 20-Ft. 8-In. Tank.

Labor, except excavation	$1,845 40
Freight and handling	1,268 19
Excavation, 58.7 cents a yard	2,732 40
Pumping	724 66
Brick	1,673 60
Iron straps	24 95
Sand	80 00
Coping, base and land stones	337 00
Cement	1,800 00
Soap and alum wash	28 62
Sundries	50 00
	$10,564 82

The cost of similar parts of a steel tank this size was $7,600, representing a saving of nearly $3,000.

The cost of the ironwork on nine tanks varying in diameter from 57 feet to 125 feet 6 inches, and in the depth from 18 feet 9 inches to 31 feet, not including inlet connections or any parts except those specified in the foregoing, varied from 6.64 cents to 7.45 cents per cubic foot capacity of the tank. The equivalent parts in masonry tanks cost from 30 to 60 per cent. more than this.

Maintenance.—As the steam used in heating tanks is not kept separate from that used around the works for other purposes, it is impossible to state positively from experience how much more coal it takes to heat a steel tank than it takes to keep a masonry tank from freezing, but we may approximate it. The condition of the surface will be approximately the same in each case, so all that will be necessary will be to find the heat lost through the sides of the tank.

We will assume a tank 102 feet diameter and 20 feet 10 inches deep. Temperature of atmosphere, 10° F.; temperature of water in tank, 40° F.; number of days, 150.

Rankine gives the following formula for the passage of heat through a metal plate from a liquid to air or *vice versa:*

$$q = \frac{T^1 - T}{\sigma + \sigma^1 - \rho x}$$

q = the number of heat units passing through each sq. ft. in 1 hour.
T^1 = the higher temperature.
T = the lower temperature.
$\sigma + \sigma^1$ = the surface resistances to heat.
ρ = the coefficient of thermal resistance of metal.
x = the thickness in inches of metal.
ρx is so small that it may be ignored.

$$\sigma + \sigma^1 = \frac{1}{A\,[1 + B\,(T^1 - T)]}$$

$A = 1.5$, $B = .0037$, $T^1 - T = 30$; hence,

$$\sigma + \sigma^1 = .6 \qquad q = \frac{30}{.6} = 50$$

Fifty heat units will be lost per hour through each square foot of iron in the side of the tank. The total area of the side equals 6,676 square feet; hence there are lost 333,800 B.T.U. an hour.

Assuming that the boiler used for heating evaporates 7 pounds of water for each pound of coal, and delivers it at the tank at 212°, this will represent a consumption of 42 pounds of coal an hour, or 1,008 pounds a day. In 150 days 67½ long tons would be used, which, at $3 a ton, would cost $202.50. Assuming that the temperature never fell below 10° F., 10-horse power would be sufficient for all heating; but if, while averaging 10° F., it should at times fall to —20° F., 20-horse power would be necessary. There are few places in this country where the thermometer would average so low, so this assumption is an extreme one. In addition to the cost of heating must be added about $50 a year for painting, making a total of $252.50 per annum for excess heating and maintenance.

On the other hand, but few masonry tanks are tight, and there is a constant charge for water that is used in them; occasionally they start leaking unusually badly, and it is necessary to partially pump out the water for repairs. A hundred dollars a year is not too much to assume for the cost of water and repairs for the average 100-foot masonry tank. This leaves about $150 for the excess of the cost of maintenance of the new metal tank over the masonry tank, which is 6 per cent. on $2,500.

Durability.—Inasmuch as the steel tanks are comparatively new, it is not possible to state just what their life will be; but with proper care they should last indefinitely. The water in a holder tank is saturated with oils, and has no tendency to destroy iron. Holders begin first to corrode at the point that is in and out of the water most frequently, and when the holder is so badly rusted as to be useless, the part that is always immersed is found to be in good order. The portion of the tank that requires most attention is that just at the surface of the water, but a little attention will keep it from rusting at that point.

The single weak point is the bottom of the tank. There is no danger from within, but it is inaccessible from without, and is liable to deteriorate. It is not possible to bed the bottom firmly in cement on account of its size, but it should be grouted well, so as to exclude as far as possible all air and water. If this is done there is no reason why a bottom should not last a great many years. If the soil is fairly dry and is kept drained, the bottom should last as long as the tank.

To sum up, a steel tank is to be preferred to a masonry tank because:

1st. Its cost can be closely estimated before construction is begun.

2d. It is always possible to get a good, tight tank.

3d. It can be built in much less time than a masonry tank.

4th. It costs less.

5th. The extra heating and maintenance amount to much less than the interest on the saving.

In conclusion, I will add that I have just witnessed the completion of the largest metal tank in this country, its capacity being slightly over 1,400,000 cubic feet. When it was filled with water not a leak was discovered. It is now perfectly tight, though it has not been touched with a caulking tool since it was filled.

Discussion.

The President—This is a paper of great interest to us all, and it contains something new to many of us. Mr. Miller will answer any questions that any of you wish to ask with regard to the matter.

Mr. Thompson—I would like to ask Mr. Miller if this was an ordinary tank, or whether it was of the double annular form. I understand that a patent was taken out some few months ago, by Mr. Fred. Mayer, of Baltimore, for reinforcing tanks, or rather for placing above and on top of the main portion of the tank a detachable steel lining, against which the water line would ordinarily come, and providing an overflow slightly below that, so that, as occasion requires, the water can be lowered as far as the upper ring, to the end that, in case of corrosion, that part could be reached and renewed. Have you had any experience with that form?

Mr. Miller—I have had no experience with that form of tank. This tank was simply a plain one, with the bottom attached, and with no ring inside of it. In fact, you could not hold water with a tank so large as that described by Mr. Thompson, made in annular form, without very powerful bracing inside. The plates in the bottom course of this tank were the largest ever rolled in this country. They are 1$\frac{3}{32}$ of an inch thick, 52 inches wide, and 24 feet 9 inches long. That makes the very heavy sheet necessary to hold water in a tank 190 feet in diameter and 50 feet deep. It would be hard to get an annular tank inside of that without filling it full of earth, or something of the kind, to withstand the pressure.

Mr. Clark—I would like some information as to whether the formula which Mr. Miller gives for the transmission of heat through that side of the tankplate would be affected by motion in the air—by the wind. Mr. Miller states as one of the advantages of a steel tank that it can always be made tight. Perhaps it can be, but it is not. That is just what can be said of a masonry tank. Masonry can be made tight, but it is not. I know of one steel tank that is leaking very badly through the bottom, and it is just as hard to repair as is a masonry tank. All the water must come out of the tank before it can be made tight. There are leaking masonry tanks all over the country; but that does not prove that masonry tanks cannot be made tight. Even those leaking tanks could probably be made tight and no harm done to any part of the structure. If a coating of asphalt is properly put on in the first place a masonry tank would never leak, as I believe. The advantage of masonry tanks is that when once properly finished and made tight they require no further care at all. Of course, it is necessary to keep the snow out of them, as it is to keep it out of steel tanks. There is no necessity for doing anything else to them if the tanks have been properly built and the walls properly prepared. And as to the bottom, unless located in a specially disadvantageous position, it is just as secure at the end of ten years as it was at first, and probably more so. The question of foundations has not been much referred to, and I understand from Mr. Miller's paper that he thinks the burden of proof is on the advocates of the masonry tank. A steel tank will often require piling, where a masonry tank will not; because, after taking out 20 feet of earth for the masonry tank you are very apt to get down to a foundation which is good and sound, whereas, if the surface is not good and sound, you would have to pile for a steel tank and would not have to pile for a masonry tank.

Mr. Forstall—While I cannot give any exact figures as to the cost of keeping water from freezing in a masonry or in a steel tank, I am in a position to give some comparative figures. We have one masonry tank 125 feet in diameter, and a steel tank, very near it, 50 feet in diameter. During the cold weather this winter we found that with the steam jet arranged as we had it arranged, by turning an ¼ inch pipe inside of a 1¼ inch T, so as to make a syphon action through the T and create a current of water all around our tank, one of those jets would keep the 125 feet masonry tank entirely free from ice; but in the very coldest weather it required two such jets in the steel tank. That was for one week in the coldest weather. The rest of the time one jet had just about all it could do to keep the ice out of the steel tank; while in the masonry tank there was no ice at all.

Mr. Humphreys—I do not understand Mr. Miller to make it a point that it is impossible to get a steel tank that will leak. Of course we can have bad workmanship in the construction of a steel tank or anywhere else. I understand Mr. Miller to make the point that it is much easier to get a tight tank with steel than it is with masonry. The facts will warrant that claim. As to foundations, it may not always hold good, but you know that very often, if you do not disturb the surface of the earth at all, or no more is required than to simply level the surface, we can take care of very heavy weights by a proper arrangement of concrete foundation; whereas, if we cut down and disturb the original surface, we may get into all sorts of soil, some of which may give us great trouble. You will recall that there have been large chimneys successfully built on "floating" foundations, and many structures absolutely depend for their integrity upon the undisturbed condition of the original surface. That would all be in favor of steel tanks. In designing a

gasholder tank, if on account of local conditions we have *any* doubt as to the excavation, a steel or iron tank should be our choice. The point that Mr. Miller makes, that you can, in the first place, more correctly estimate the first cost of a cast steel tank, is, of course, all-important to us as engineers.

Mr. Miller—In reply to the question of Mr. Clark, as to that formula for the passage of heat through a metal plate, I will say it is the formula used in boiler practice, in which there is a very rapid current of hot gases passing along the surface and giving off heat to the water. It is there used in the opposite direction, but it works either way, so that everything would be in favor of less heat passing through than the amounts I have allowed; because, in contact with the surface of the tank, the wind would not as a rule pass as rapidly as the gases do along the heating surface of a boiler. I have allowed a slight difference in the constant *A* on account of the slight difference between the condition of the surface of a tank and the condition of the surface of a boiler. The surface of a boiler, which is very black, takes heat more easily than does the surface of a tank which is painted; but, at the same time, after it is weather worn, it would approximate that same condition. As for the foundation, I say it takes less foundation for the metal tank than it does for the masonry one, because there is less weight to be carried. The weight of the iron is so small on the bottom itself (it is only from ¼ to ½-inch thich), that it would be practically negligible. So that all over the bottom, on the interior of the tank in each case, we have only the weight of the water to carry on the foundation. Then we have the iron sides to compare with the masonry walls. The guide framing and the weight of the holder would be the same in each case, which gives us an advantage in favor of the metal tank. Of course the weight must be carried in either case, but we have less weight in the metal tank than we have in the masonry one. I admit it is possible that we may have some swampy ground that it would be to our interest to dig out; but I also say that in a great many cases we have a good surface and a bad sub-stratum. It is very much better to know what you are going into in the first place than to dig down and get into this bad sub-stratum; and, after having made your estimate, to find that you have to dig indefinitely. One particular case I remember (and which probably Mr. Clark knows about) was where they started on the excavation of a 120-foot hole, and got nearly 300 feet before they got the tank in; and that tank is leaking to-day. As to keeping tanks tight, I think that Mr. Clark lost my point. I do not mean to say it is necessary that a tank should be tight, and that anybody can build it tight; but I do say that with ordinarily fair workmanship you can get a tank tight, and that you can keep it tight. If you put a tank on a bad foundation and let it settle out of shape it must leak. Unless you have such an enormous excess of strength in the iron that it will hold itself up when only partly supported, it must strain and leak; but if you start out with a good foundation no settlement will take place in a steel tank that would not take place in a masonry tank with the same foundation. Further, when a masonry tank settles it will crack the tank and be almost irreparable, while in a metal tank that can be caulked up and the rivets be redriven. Of course the water would have to be pumped out of the tank the same as in repairing a masonry tank. So I think that as to repairs everything is in favor of the metal tank. Of course the bottom is the weak point, and it is an important thing to see that the foundation is right before the water is put in, and since the bottom is the weakest point in the whole structure it should therefore be watched very much closer than any other point. The other leaks can probably be caulked up from the outside, but those on the bottom cannot.

On motion of Mr. Butterworth the thanks of the Association were voted to Mr. Miller for his paper.

The President—We will now turn our attention to the paper by Mr. George H. Harper, of Altoona, Pa., entitled

ADVANTAGE OF THE METRIC SYSTEM FOR ALL CALCULATIONS.

A very eminent writer on the metric system of weights and measures, in the opening paragraph of one of his works, makes use of the following language: "No cause, since the earliest organization of civilized society, has contributed more largely to embarrass business transactions among men, especially by interfering with the facility of commercial exchanges between different countries, or between different provinces, cities, or even individual citizens of the same country, than the endless diversity of instrumentalities employed for the purpose of determining the quantities of exchangeable commodities. For the inconvenience and confusion resulting from this cause, but one effectual remedy can be suggested, and that is the general adoption throughout the world of one common system of weights and measures."

The Hon. John Quincy Adams, as Secretary of State, in a report to the House of Representatives of the 16th Congress, under date of February 22, 1821, lays down the following principles as those which must underlie any general or universal system of metrology.

First. That all weights and measures should be reduced to one uniform standard of linear measure.

Second. That this standard should be an aliquot part of the circumference of the globe.

Third. That the unit of linear measure, applied to matter in its three modes of extension, length, breadth and thickness, should be the standard of all measures of length, surface and solidity.

Fourth. That the cubic contents of the linear measure, in distilled water, at the temperature of its greatest contraction, should furnish at once the standard weight and measure of capacity.

Fifth. That for everything susceptible of being measured or weighed there should be only one measure of length, one weight, one measure of contents, with their multiples and subdivisions exclusively in decimal proportions.

The principles here laid down have never been successfully assailed, nor can they be. On the contrary, they have been indorsed and supported by speech and pen of the very ablest thinkers, scientists and educationists of this country and of European and other countries.

If, then, it be conceded that the above definition embodies everything necessary or desirable in a universally applicable system of weights and measures, I believe the members of this Association will, without hesitation, further concede that the metric system is possessed of every essential virtue specified.

Every system of weights and measures is based upon a standard unit. The standard unit may be natural or artificial. That is, it may be an aliquot part or multiple of some unalterable property of the earth or some one of its products, or something chosen arbitrarily. The underlying idea in either case is facility for duplication, ease of verification and general convenience in commercial use.

The basic unit of the metric system, the metre, belongs to the former class, and is the one 10-millionth part of a quarter of the meridian, measured through France, from Dunkirk to Barcelona, in Spain.

In the metre we have a unit which is at once permanent, easy of practically absolute verification, and of such a length that, as a linear measure, it possesses great adaptability to the mechanical arts and the needs of commerce; while its relationship to measures of surface, capacity and weight, is at once the most positive and the simplest possible, and calculated to facilitate, in the most marked degree, the interchange of commercial products among the nations.

The following tables show the multiples and subdivisions of the unit in its relation to length, surface, capacity and weight, the metre being the unit of length, the are of surface, the litre of capacity, and the gramme of weight.

Unit of Length.

Myriametre....	10,000	Metres.
Kilometer.....	1,000	"
Hectometre....	100	"
Decametre.....	10	"
Metre.....	1	"
Decimeter.....	0.1	"
Centimeter....	0.01	"
Millimetre.....	0.001	"

Unit of Capacity.

Hectolitre....	100	Litres.
Decalitre	10	"
Litre	1	"
Decilitre	0.1	"
Centilitre.....	0.01	"
Millilitre.....	0.001	"

Unit of Surface.

Hectare	100	Ares.
Are	1	"
Deciare.....	0.1	"
Centiare.....	0.01	"

Unit of Weight.

Kilogramme	1,000	Grs.
Hectogramme.....	100	"
Decagramme.....	10	"
Gramme	1	"
Decigramme.....	0.1	"
Centigramme.....	0.01	"
Milligramme	0.001	"

The are is 100 square metres, and a cubic centimetre of distilled water at its maximum density, weighed at sea level, in Paris, is $\frac{1}{1000}$ of a litre, and weighs one gramme. There is thus established throughout the system a direct, simple and perfectly intelligible connection to the basic unit.

Have we not, then, in the metric system, a system of weights and measures that fully meets the needs of an international or universal code, as these needs are set forth by Mr. Adams? The standard is an aliquot part of the earth's circumference, the unit of linear measure is applied to matter in its three modes of extension, the cubic content of the linear measure furnishes the standard weight and measure of capacity, and its multiples and subdivisions are exclusively in decimal proportions.

In the "Imperial" system as used in Britain, and nominally in the United States, the unit of length is the yard, containing 36 inches; of weight, the pound, of 7,000 troy grains; of capacity, the gallon, the contents of which measure 277.274 cubic inches, and weighing 10 pounds avoirdupois at the temperature of 62° F. and 30 inches barometric pressure. In addition to these standards there are in use troy weight, apothecaries' weight, cloth measure, yarn measure for cotton and linen, wine measure, beer measure, dry measure, and a large number of so-called customary measures.

I refrain from giving any tables showing the relationship, or the lack of real relationship, of these standards to each other, because I am convinced that the unbiased student, who looks to the "Imperial" system as a possible basis for a universal system of weights and measures, will find his difficulty to be, not the reconciliation of a few points which are now at variance with the orthodox creed as set forth, but to find even one point of agreement; or in fact anything on which a reasonable and intelligible system could be based.

If the premises be correct, that a simple, universal system of weights and measures would greatly facilitate and increase the interchange of commodities among nations, it were hard to conceive of anything better calculated to retard and discourage such commercial activity than the vast mass of ill conceived, illogical, and wholly arbitrary units, which does duty as a system in this country and Britain; the multiples and subdivisions of which are difficult to understand, hard to remember and wasteful of time, and, in their multiplicity, encourage inaccuracy.

The United States and Britain are, by their policy of isolation, the primary cause of the chaotic condition of the metrology of the world to-day, and the chief factors in preventing a consummation much to be desired. Nor is that all. They are inconsistent with themselves and with each other. In Britain a large number of "customary" weights and measures are in common trade use, which have little, if any, relationship to the legalized standards; and are, in their very nature, the cause and consequence of the lack of universality of methods so much to be deplored. In the United States customary weights and measures are equally rampant; there being almost as many legalized weights for a bushel of a given commodity as there are States in the Union. It takes 1.75 bushels of rye bought in Louisiana to make up the same measure in the neighboring State of Georgia; while a bushel of sweet potatoes bought in Iowa is short of that measure by 10 pounds when it reaches Maryland.

The standard units of weight and capacity in Britain are the avoirdupois pound of 7,000 troy grains, giving 2,240 pounds to the ton; and the imperial gallon containing 277.274 cubic inches, and weighing 10 pounds; the corresponding standards of the United States being the troy pound of 5,760 grains, giving 2,000 pounds to the ton, and the Winchester wine gallon, containing 231 cubic inches and weighing 8.339 pounds. It would, I think, require considerable ingenuity to add to all this confusion.

Could the world speak a common language as to its weights and measures, what a vast field for intelligent research would be opened up to us. All the magnificent literature of foreign learned and technical societies of every kind, as well as the invaluable matter purveyed by the technical and scientific press of this and other countries, would become common property; and while we might be unable to speak in our brother's tongue, his figures would be perfectly intelligible, inciting criticism or stirring to emulation. The chemist, the architect, the engineer and the statistician would appeal to a constituency as wide as the universe itself.

There is much even in the technical press and literature of countries speaking the same language as ourselves, which is comparatively valueless to us because the kernel is encased in a shell of long tons, cwts., qrs., lbs., imperial gallons, grains and septimeters, too hard for ordinary American teeth to break.

The commerce of over 400,000,000 of people is carried on to-day exclusively by the metric system. It has been adopted by France, French Colonies, Holland, Dutch Colonies, Belgium, Spain, Spanish Colonies, Portugal, Italy, Germany, Greece, Roumania, British India, Mexico, New Grenada, Ecuador, Peru, Brazil, Uruguay, Argentine Republic, Chili, Austria, Costa Rica, Egypt, Netherlands, Norway, Sweden, Switzerland, Denmark, Danish Colonies, Turkey, United States of Colombia, Venezuela, and is permissive in the United States of America, Great Britain, and the British Colonies.

Is not this almost universal adoption itself sufficient evidence of the universal adaptability of the metric system to the needs of mankind; and shall the English speaking nations alone, then, whose interests in a universal system of metrology are greater than all others, retard the progress of the world? We are all creatures of circumstance, and are largely what our environment has made us, but that is no reason why we should allow our familiarity with, and filial regard for, any particular system so warp our judgment that we cannot see and appreciate the beauty and intrinsic merit of another system.

Numerous and strong petitions have from time to time been presented to the government of the United States and Britain, praying the adoption of the metric system. These petitions have been presented in this country by such societies and organizations as the National Academy of Sciences, American Association for the Advancement of Science, Boston Society of Civil Engineers, American Institute of Mining Engineers, American Medical Association, American Pharmaceutical Association, and many others. In Britain by every technical and scientific body, including the British Association for the Advancement of Science and the Associated Chambers of Commerce. To what tribunal, then, shall we look for an authoritative deliverance on the merits, or otherwise, of the metric system if this "great cloud of witnesses" be not authoritative?

If, then, we are agreed that the metric system is applicable as a universal system of metrology, and that such a system is desirable, is it not possible for us in our individual and collective capacity to contribute something toward the advancement of the cause? Can we not, individually, persistently, base all our private work on this beautifully simple system, and, collectively, make all our contributions to this Association, and the Association's records themselves, conformable to it?

There have been many objections to the metric system, but not a few of the objections do more credit to the zeal than to the intelligence of the objectors.

It has been asserted by some that the metre is not the one-ten-millionth of a quarter of the meridian, because measurements taken of other arcs of the meridian give discordant results. The discrepancy arises from the fact that the earth in solidifying has been absurd enough to assume a form which is neither a true spheroid nor a true ellipsoid, so making concurrent measurements practically an impossibility. All this, however, does not impugn the measurement of the arc of the meridian on which the metre is based, which remains as a fixed and invariable standard, susceptible of the most accurate verification.

Another objection urged is the great length of the metre and its inconvenience of application to the mechanical arts. An ordinary 2-foot rule looks formidable when spread out to its fullest extent, but when folded, as the metre may be, goes into a comparatively small space. I do not think the ordinary mechanic would require to expand his rule pocket very much to accommodate a metre rule.

It has been objected to in this country on the gronnd that it is un-American. Is it any more so than the argument brought against it?

One objector invokes Divine wrath on the system, because, as he asserts, it is one of the offspring of the "wildest, most bloodthirsty, and most atheistic revolutions of a whole nation that the world has ever seen." It is not; but what if it were? Is a pearl less a pearl because found associated with an oyster?

I will cite but one more objection, and that, perhaps, the most amusing of all. I quote from a report of a committee of the Boston Civil Engineers' Society. "Indeed, so prominent is the theme that we are told the *Congregationalist* opposes the metric system, because it does not want to have the revised edition of the New Testament read: 'Neither do men light a candle and put it under a hectolitre.'"

In conclusion, permit me to commend the metric system of weights and measures to the careful consideration of every member of this Association. Such consideration can lead to but one result, and that is to convince him of the possible universal use of the system, the beautiful simplicity of its multiples and subdivisions, the facility it gives for rapid and accurate calculation, and, lastly, that it is the system used by a large majority of civilized nations.

It is being rapidly adopted by many of the largest manufacturing establishments in this country and in Britain, solely on its merits, and in anticipation of any compulsory legislation of any kind. Shall this Association be among the laggards in the race?

Discussion.

Mr. Clark—It is very evident that Mr. Harper's paper is a difficult one to discuss, and the case is certainly well presented by him. There can be no doubt that great convenience would result from the universal adoption of a metric system; and there can be no doubt that the metric system (whether the metre is really the one ten-millionth part of a quarter of a meridian, or not), answers every purpose that is desired. I understand that, while the United States Government has not made the metric system compulsory, Congress has passed a measure upon the subject,

and that the courts will recognize transactions made under the metric system. I think the introduction of the metric system will necessarily be a matter of slow growth, as we can hardly compel the people to give up the measurements with which they are familiar. It is, however, now used largely in teaching. My son, for instance, is learning the metric system at school, and all the scientific bodies of the country use it. I think it very possible that those of us who are still young—you and I, Mr. President, and a few others—may live to see the time when it will come into quite general use in this country. I hope, if there is anything this Association or any other Association can do to hasten that day, we will not fail to take proper action.

Mr. Thompson—For the past 23 years the principal agitation in favor of the adoption of the metric system has been by the American Metrological Society, of which Professor T. J. Mendenhall, late Superintendent of the United States Coast and Geodetic Survey, and an honorary member of this Association, is Vice-President. I have here one of the pamphlets issued by that Society, from which I beg leave to read a few extracts bearing on the difficulty of adopting the metric system: "The only real objection to adopting the metric system is that to make any improvement in our accustomed practice is difficult and troublesome; it is very much easier to let things slide. This difficulty can be overcome in business in the United States, as it has been overcome in science in the United States, and in business in Europe and South America. As an example of the former, the metric system has been completely adopted within the memory of the present generation in chemistry, from which it naturally works into use in assaying, metallurgy, pharmacy and medicine." Again—"Mr. Percival Fowler said: 'He could speak from practical experience in Spain. In a week the workmen became thoroughly conversant with meters, centimeters and millimeters; and he was certain the difficulty of changing the English system of weights and measures to the decimal system had been greatly over-estimated.'" And once more—"Mr. Hamilton Smythe said: 'In Austro-Hungary, for instance, the metric system was extensively used by engineers for their own convenience for some years previous to its general introduction. It had become the interest of contractors and workmen to make themselves acquainted with the terms of measurement, in which the plans, specifications and bills of quantities supplied to them by their employers were expressed, and thus through the medium of the working class a knowledge of the system had been extensively spread through the mass of the people before the system was made legally compulsory for the purposes of general commerce.'" In 1866 the Congress of the United States made the adoption of the metric system optional in this country, and it has since re-enacted the provision of its original action. There is one more reference here: "The agreement between the United States and Great Britain, signed at Washington, June 18, 1880, for increasing the limits of magnitude of packets exchanged through the post between the two countries, uses the gramme and centimeter, and contains no reference to any other unit of weight or measure." The American Metrological Society has for its object the increase of the use of the metric system for the great convenience of comparing reports between the scientific bodies of this country and of the other countries of the world. It provides for its fellows, members and associates the various periodicals, pamphlets and printed matter of the various concerns which may join. It provides for the membership of individuals and of organizations on the basis of the payment of $5 per year for members. In view of the final sentence of Mr. Harper's paper, "Shall this Association be among the laggards in the race?" I would present the following preamble and resolution:

Whereas, The metric system of weights and measures is the most convenient and scientific method of measurement, and is destined eventually to displace the system now in vogue; and,

Whereas, The Western Gas Association recognizes the importance of supplying scientific as well as practical data in the reports of its proceedings; be it

Resolved, That this Association authorizes the use of metric equivalents, as well as customary values, in all papers and reports; and, be it

Resolved, That this Association enter the membership of the American Metrological Society as the Western Gas Association.

For my own part, in any paper which I may prepare, or in any report I may present, I pledge myself to use the metric equivalents as well as the customary equivalents. I move the adoption of the resolutions I have read, (Seconded by Mr. Forstall.)

Mr. Greenough—I think that is, with great respect to Mr. Thompson and the gentleman who has read the paper (Mr. Harper), pushing the Association a little too far. I see no reason why any gentleman may not present his reports or papers in expressions of metrical equivalents if he pleases to do so; but I must say they will be only more or less intelligible to nine-tenths of us, while in our everyday business affairs we shall have to continue to employ the more familiar terms of cubic foot, yard and bushel. And as for saying, as the framer of this resolution does, that the question of the adoption of the metric system is simply a question of a short time, I cannot agree with him.

Mr. Thompson—I did not say in a short time; I said "eventually."

Mr. Greenough—I question it extremely. I do not see that they have made any substantial progress in either Europe or America in the last 15 or 20 years. The two great trading countries of the world, who do nine-tenths of the business of the world, do that business wholly on another basis; and I cannot see that in either of those countries they have made the least progress in the general adoption of the metric system. I question very much whether the change from our present system to the other is going to be anything like as rapid as was anticipated a few years ago, when the question was first agitated. I think it is a little premature for this Association to take the step proposed.

Mr. Thompson—I trust that this resolution will be fully discussed before it is put to a vote, because Mr. Greenough misapprehends my intention. It is not the idea to do away in any degree with the customary methods. It is not the idea that any report shall be made in the metric system wholly. The idea is that parallel columns will be given, so that we shall more rapidly accustom ourselves to the consideration of metric equivalents, as well as the customary equivalents; not that the metric equivalents shall displace the customary.

Mr. Humphreys—Will not Mr. Thompson explain what the membership of this Association in the American Metrological Society involves?

Mr. Thompson—Membership in that Society provides for the receipt by the Association of all the papers and reports of the action of that Society; so that we are constantly provided with the data and reports of the work being done by the Metrological Society. It provides also for the representation of the Association, by some duly authorized individual, at the annual meetings at Washington, and for voting by proxy on any question if a representative is not personally present. My object in moving to join that Society was more especially that we may be possessed of the information which the Metrological Society is constantly disseminating. I will add that the expense of membership is only $5 per year.

On the adoption of the resolution a standing vote was called for, and it was determined in the affirmative by a vote of 15 to 7.

Mr. Miller—If the discussion of Mr. Harper's paper is still in order, I would like to suggest that one side of this question has not yet been touched upon. In the shops of Germany and of France the inch is used for all gauges, taps, dies, bolts and such things. They found from experience that the metric measure was not adapted for shop practice. They find that the measurement of their gauges and standards in millimetres is too fine, and so they take inches and fractions of inches; and they have the same gauges, taps, dies and shop standards that we have in this country. As matter of fact, their fine machinery to a large extent is supplied from here. That is on account of the fact that the metric system is not, in their experience, found adapted to shop work. I think, in the gas business, a very large amount of our work is done with dies and gauges. Before we go into the subject very deeply, it would be well to see how much is done in inches practically and how much that would vary from our shop standards; in other words, how much of our work is shop work, and how much is scientific work. Of course, in this country at the present time, a very large proportion of the chemical and physical work is done in the metric system, and is so recognized. Of course, if we do any fine physical work it would be proper to put it in the metric system; but almost all of our work is in American measures. We buy in dollars and cents and in American measures; and I think we would be more likely to be free from mistakes by using the measures with which we buy and sell.

Mr. Clark.—Mr. Miller has called our attention to the fact that we are using in our currency a decimal system. The statement has been made that the millimetre is too fine a measure for use in making dies. But the centimetre may not be, or, if it is, the decimetre is not. The meter is subject to as many subdivisions as is the inch or the foot, and the fact is that decimals of the inch and of the foot are used in making dies. I cannot discern, therefore, any great difficulty in using the metric standard. I do not understand that any reference is made to the difficulty of measuring anything by millimetres. We have heard that the United States and Great Britain, the great trading nations of the world, have not adopted the metric system, but the United States has adopted the decimal system in its currency. And while I have not had the advantages of some of the gentlemen here in becoming familiar with English money, and perhaps if I had I would not find the trouble I now have, certainly pounds and shillings do not convey to me the ideas that dollars and cents do. These great trading nations, the United

States and Great Britain, have been straightening out everything else; they have been making trade easy (barring the tariff) in every direction possible, and there can be no reasonable doubt, I think, that the time is soon to come when they will remove this final obstacle to easy trade and easy calculation and come to the metric system, or at any rate to the decimal system.

Mr. Miller—In speaking of the use of the metric system in gauges, etc., for shop practice, I was not figuring on probabilities, but was speaking of what is actually done in those countries and of the excuse they give for doing it. They say that the inch standard is better adapted to shop practice than is the metric system. I have never gone into the question in detail; and I simply know the fact that these metric nations are using the inch standard in their shops, and that that is the excuse they give.

On motion of Mr. Jenkins (seconded by Mr. Miller) the thanks of the Association were voted to Mr. Harper for his paper.

[To be Continued.]

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the meeting last May, of the Pacific Coast Gas Association, Mr. T. R. Parker, Superintendent of the Napa City (Cal.) Gas Light and Heating Company, was named to the Chairmanship of the Association's Committee on Wrinkles, and that he has been considering the duties connected with the position is pretty well shown from the following letter received by us last week:

Napa, Cal., May 15, 1895.

To the Editor American Gas Light Journal: It is the purpose of the Pacific Coast Gas Association, at the coming July meeting, to have an exhibition of all possible or obtainable gas appliances, either for light, heat or power, as used in the arts, manufactures or in the domestic circle. For instance, meters and motors; stoves and ranges; kilns and heaters; incubators and ovens; burners—incandescent and regenerative, luminous and non-luminous; blowpipes and gas blast, hot and cold; novelties for the laboratory and workshop, the parlor or the kitchen; objects of interest to the public and of profit to the producer. A cordial invitation is extended to the manufacturers and inventors in the named lines to produce their wares, and every facility will be extended to make suitable provision to display their goods, as to floor space and supply of gas without expense to them. An invitation is also extended to designers and inventors of gas producing apparatus, in models, plans or contrivances in forms of construction, etc.; furnaces, regenerative, recuperative or reverberative, heated by coal, coke, breeze, tar or oil; generators, carbureters and superheaters—in fact, anything that will simplify, amplify or modify the manufacture of gas for producing light or heat, whether it be from coal, oil, calcium carbide, or other substances. To the meter manufacturers we also make our bow and invite them to show their latest—wet or dry, square or round, triangular or oblong, prepayment or deferred payment, with connections top and bottom, on either side, or both on one side, straight reading index, or as of old. We want them to recognize this invitation and put their best meter forward. We further extend an invitation to those who make a specialty of gas house supplies, in the shape of handy tools, either for the workshop, retort house, generator room or street department. Any description of tool or machine that will facilitate the tapping or cutting of mains, the caulking of mains, or contrivances for jointing mains, machines for ditching or tamping—in fact, anything which is an advance. To the manufacturers of main pipes we invite their latest to prevent electrolysis and preserve the pipes—everything they may have new or interesting in pipe lines or connections. We invite specimens of gas coals and gas oils, or other gas producing substances, with their approximate values as shown by analysis. To the manufacturer of products from gas works residuals, we would be pleased to examine the results of their labors and to learn how to produce a marketable article for their purpose, so as to save that which is now wasted. The gas fixture manufacturer will be taken into consideration and allowed all ceiling space necessary with a liberal supply of the most improved candle power burners; a practical demonstration of the light-giving powers of acetylene gas—calcic carbide will be manufactured in an electric furnace on the premises, and a sufficient quantity of the material will be on hand to make the exhibition interesting. This is the first general invitation extended by a Gas Association to manufacturers, dealers, inventors, or their agents, to participate in an exhibition of special articles or contrivances peculiarly adapted to the business which we meet to advance. The territory embraced by the Association is large, comprising the States of Nevada, Oregon, Washington, Utah, New Mexico, Arizona and California, covering a large and increasing gas consuming district. It is for the mutual benefit of the manufacturer and producer that this move is made, so that on occasions of this kind the merits of the new and demerits of the old can receive proper and just investigation. We hope this notice will meet with a hearty recognition and that kindred Associations will follow suit and so encourage originality in the making of displays for the general good of all. Parties taking advantage of this offer will please make it known to the undersigned, between now and the 17th of June, so the necessary provision may be made in time. All goods forwarded are to be consigned to Mr. E. C. Jones, San Francisco, and communications for further information should be addressed to "T. R. Parker, Supt. Wrinkle Department, Napa City, Cal."

When the authorities of San Francisco attempted some months ago to order a reduction in the local gas rate of 15 cents (from $2 to $1.85 per 1,000 cubic feet), the measure was eventually negatived; but during the argument on the matter, President Crockett declared that when the San Francisco Gas Company could see its way clear to making a reduction in the price of gas such concession would be made at once and cheerfully. President Crockett evidently, as is usual with him, meant what he said, for we are advised that the Company will, on July 1st, commence to supply gas for illuminating purposes at the rate of $1.75 per 1,000 cubic feet. We also understand that the rate on gas used for cooking, heating and power purposes, supplied through separate meters, will be sold at $1.65 per 1,000 cubic feet. We are not positive, however, as to the latter. In explaining this action of the Company, President Crockett recently said: "Our determination was brought about by the fact that since we completed our magnificent new works at North Beach Station we find we can manufacture gas cheaper than before, and is also due to the fact that the prices we pay for materials have gone down considerably within the last year. The San Francisco Company has always shown its regard for its customers by reducing the price whenever it has been able to do so. Last year, when the Supervisors advocated reducing the price to $1.85, I stated that the Company would voluntarily reduce the price whenever the time should come that it could be done in justice to the stockholders. That time has now been reached, and the promise is to be made good. This cut in rates means a large reduction in the revenue of the Company, which it will be enabled to meet by new improvements in the manufacture of gas and the present low prices of materials." Good for the Company; and good for its President!

Mr. C. J. R. Humphreys, the Agent of the Lawrence (Mass.) Gas Company, is also out with a notice of reduction in the selling rate, which reduction is to date from June 1st. Perhaps the safest way to report this evidence of the Company's good faith to its consumers, and of Mr. Humphrey's up-to-date business ability as well, is to print the text of the official announcement, which is as follows: "Gas consumed on and after June 1st, until further notice, will be charged at $1.50 per 1,000 cubic feet, subject to a discount of 20 cents per 1,000 cubic feet if the bill is paid by the 15th inst., provided no previous bills remain unpaid. This leaves the net cash price $1.30 per 1,000 cubic feet."

We are more than pleased to say that the proprietors of the St. John (N. B.) Street Railway Company, who are now in complete control of the gas and electric lighting supply of that city, have determined to retain the services of Mr. George R. Ellis in the management of the gas division of their properties. Mr. Ellis served the Gas Company for years with zeal and efficiency.

Some people say that Penns Grove, N. J., is to have a gas company, but we fear that its population (about 3,000) is not up to the point of profitably maintaining such an undertaking. It is located on the Delaware river, perhaps 29 miles below Camden and 5 miles or so east of Wilmington, Del. It is the southern terminus of the Delaware Shore Railroad, and is noted for its manufactures of lime and carriages. It also boasts of a fairly well equipped ship yard.

The voters of Arlington, Mass., have negatived the proposition to establish and maintain an electric lighting plant on municipal account.

At the annual meeting of the Portland (Me.) Gas Light Company the officers chosen were: Directors, Messrs. Edward H. Daveis, Wm. W. Thomas, Wm. H. Moulton, Fred. N. Dow, Chas. S. Fobes and Zenas Thompson; President, Edward H. Daveis; Treasurer and Clerk, Samuel Rolfe. The following excerpts are from the annual report of President Daveis: "The consumption of gas for the year ended April 30th was 60,945,800 cubic feet, against 55,836,600 cubic feet for the preceding year—a gain of 5,109,200 cubic feet; 6,110 tons of coal were carbonized,

and 113 tons of naphtha, yielding 67,791,000 cubic feet of gas of 19.1 candle power, being at the rate of 4.86 feet per pound of coal and naphtha. The rate of yield the preceding year was 4.93 feet. The net income from sales of gas was $39,205, against $39,314 the year before, and from coke and coal tar, $11,016, against $11,582 the previous year. Owing to strikes at the mines in the spring of 1894, our supply of coal gave out, and we were compelled to purchase two cargoes of inferior quality at a high price; hence the falling off in our net receipts and in the yield of gas per pound of coal, notwithstanding the increased consumption. We have now 3,191 consumers, an increase of 96, and have put in 37 new service pipes; 833 feet of 3-inch; 75 feet of 4-inch, and 253 feet of other diameter mains were put in during the year; 203 gas stoves have been sold at cost, making 370 now in use; 1,450 Welsbach incandescent gas lights have been placed. These reduce the consumption of gas when substituted for other gas burners; but in many cases they take the place of other illuminants. The principal renewals at our works for the current year will be of 8 benches of retorts in the westerly section of the retort house, comprising 40 new retorts to be set over improved regenerator furnaces with iron fronts, and with a new cast iron floor around them, estimated to cost about $2,600 in all."

AT the annual meeting of the Mechanicsburg (Pa.) Gas and Water Company the following Board of Managers was elected: Messrs. Fred. Wonderly, Joseph Milleisen, Joseph Elcock, G. A. Zacharias, J. H. Koller, G. W. Hauck, S. F. Hauck, H. L. King and C. Clendenin.

THE proprietors of the Cicero (Ills.) Gas Company recently concluded a novel contest, the principal purpose of which was to stimulate an interest in cooking by gas in the Oak Park and other districts of Cicero, which is really a suburb of Chicago—in that the districts are all in Cook county. From this it must not be inferred that cooking by gas was in the experimental stage in Oak Park, for prior to the competition or contest not less than 684 gas ranges had been placed by the Cicero Gas Company. The Company, towards the close of March, offered three cash prizes ($20, $10, and $5 in gold), to be awarded to the respective writers, whose essays on the "Merits of Gas as a Fuel for Cooking Purposes," after examination and criticism by a jury of three prominent women of the district, should be considered as first, second and third in order of merit. Any woman residing in the town of Cicero was eligible to enter the paper lists; the essays were to contain not less than 500 nor more than 700 words; each article to be signed "with a fictitious name," but the writer's own name had also to be separately inclosed; and the latter was not to be known either to the Company or to the jurors until the awards had been made; the literary excellence as well as the technical knowledge shown regarding the subject to be taken into consideration by the jurors; the Company reserved the right to publish any articles submitted or extracts therefrom—the real names of authors not to be published, however, without their consent; and the competition was to close on April 6th. The responses to this invitation were 38 in number, and the jurors (Mrs. Helen E. Starrett, of Oak Park; Mrs. Geo. H. Park, of Austin; and Mrs. Wm. A. Bartlett, of Ridgeland), after due deliberation, awarded the first premium to "Amy Franzel" (Miss Amy Farley, of Oak Park), the second premium going to "Dell Nash" (Mrs. Helen T. Miller, of Austin), while the third premium went to "Maud Michigan" (Mrs. William P. Brabazon, of Oak Park), the jurors further expressing regret that they were unable to award prizes to six others of the contestants. The competition was a great success, and the Cicero Gas Company is pleasantly and profitably experiencing the result in a decided boom in orders for gas cookers. In our next issue we will publish the three prize papers, and we herewith make acknowledgment of our indebtedness to Mr. N. A. McClary, President of the Cicero Company, for a statement of the facts concerning the competition.

AMONG the contracts completed and in hand by the Berlin Iron Bridge Company, of East Berlin, Conn., we note the following: Steel frame for the extension to the Gardes Hotel, New Haven, Conn., a boiler house for the Piercefield Falls (N. H.) Paper and Mining Company, and a car barn for the Wilkes-Barre and Wyoming Valley Traction Company, of Wilkes-Barre, Pa. The barn is to be 73 feet in width and 223 feet in length.

AT the annual meeting of the Montclair (N. J.) Gas and Water Company the officers chosen were: Directors, Dr. John J. H. Love and Messrs. Eugene Vanderpool, M. M. Dodd, Matthias Plum, A. B. Howe, S. W. Carey and W. H. Baldwin; President, Dr. J. J. H. Love; Vice-President, M. M. Dodd; Secretary and Treasurer, W. H. Baldwin; Supt., John Cansbrook. It was thought the Company would order a reduction in the selling rate, but the proprietors thought that, as they had a "pretty good thing," they would just "push it along." In other words, the rate remains at the old abnormally high figure.

THE beginning of the end in the Terre Haute, Ind., gas war is at hand, an application for a receiver for the opposition concern (the Citizens Gas and Fuel Company) having been made by Mr. A. Z. Foster, on the 11th inst. It is on the cards that the Terre Haute Gas Light Company will absorb the Citizens remains, and that the Dietrich syndicate will eventually take over both properties at a price that will fully repay Mr. Diell and his associates for the sturdy struggle which they have carried on, if memory fully serves us, since 1888.

THE authorities of Corning, N. Y., have authorized the Corning Gas Company to carry on the public arc lighting of that city for a period of 5 years. The arcs number 72, are to be 2,000-candle power nominal, are to burn every night and all night, and the rate is to be $100 per lamp per annum.

AT an auction sale of securities in the Auburn (N. Y.) Gas Company, the face value of which was $1,200, the purchaser's price was $1,535. Mr. Avery, President of the Company, was the buyer.

THE Milwaukee Gas Light Company will extend its mains to and through the suburb of Wauwatosa, the Supervisors of which town have granted the Company the necessary permission.

MR. FRANK HISCOCK, and other parties, through Attorney Wm. A. Beach, have asked the Syracuse Council for a franchise to enable them to distribute natural gas for fuel and other purposes in Syracuse, N.Y., at a rate not to exceed 25 cents per 1,000 cubic feet. Still another applicant for a franchise "to manufacture and sell illuminating gas for illuminating, fuel and other purposes to the city of Syracuse and its inhabitants," is "Mr. William Fitzgerald, of Chicago." Of course, "Fitz." proposes to sell gas of "superior quality" at a price that will make his efforts nothing short of a boon to the people of Syracuse. Yes; Syracuse has had experience in this direction before—but the authorities have had the common sense to protect home industry in the shape of the Company that has served them for years honestly and efficiently, hence the experience stops short of granting the opposition franchises asked for. It is safe to say that "Mr. Fitzgerald" will be allowed to remain in Chicago, where gas franchises are secured with far greater ease than along the line of the Onondaga valley.

AT the annual meeting of the Conshohocken (Pa.) Gas Company the officers chosen were: Board of Managers, J. Lukens, Alfred Craft, Alan Wood, Jr., Jas. Tracey, Wm. Summers, Howard Wood and L. A. Lukens; President, J. Lukens; Treasurer, Alfred Craft.

THE gas works at Newtown, Pa., have been purchased by local capitalists, who will expend a considerable sum in putting the manufacturing and distributing plant in good working order. The Company is controlled by Messrs. Ashbel W. Watson, Geo. C. Worstall, T. S. Kenderdine, Thomas Briggs, C. Taylor Leland and Robert Kenderdine.

LAST week we had occasion to say that the authorities of Montreal notified the Montreal Gas Company of their willingness to accept the Company's proposition to supply gas to the city and citizens on the basis of figures submitted July 10th, 1893. This week we can and do say that President Holt declines to enter into any such agreement now, and for the following reasons: "First, on account of the increased price of gas oil, which has doubled in price since the Company made its offer on July 10th, 1893, with a probability of a still further increase in price. Second, that the fixed charges of the Company have been largely increased by having to increase its capital by $500,000 to purchase, in self-defence, the plant, mains, etc., of the Consumers Gas Company, and which will be of little value to this Company until there is a large increase in the consumption of gas."

PAPERS incorporating the Indestructible Gas Burner Company, of Camden, N. J., have been filed. The capital stock of the Company is $500,000, and its officers are: President, Benjamin F. Archer, Camden, N. J.; Vice-President, W. J. Ohmer, Dayton, Ohio; Treasurer, Mr. Fornes, New York; Secretary, W. W. Goodwin, Phila., Pa. This is the Company which intends to exploit in this country the incandescent gas burner, the rights for which were secured some time ago by Mr. Goodwin and his associates.

THE Towanda (Pa.) Gas Company is meeting with great success in placing the Welsbach burner.

THE transfer of the Logansport (Ind.) Gas Light and Coke Company to the Dieterich syndicate has been formally made.

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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MONDAY, MAY 27, 1895.

Liquid Gas Enrichers.

Mr. T. Stenhouse, F.I.C., F.C.S., recently read a paper on the above subject before the Manchester (Eng.) Section of the Society of Chemical Industry. He referred to the great differences between the published statements respecting the various liquids now employed for carbureting ordinary coal gas, and described a small apparatus which he has used for volatilizing and determining the efficiency of certain hydrocarbons for enriching gas of 15 or 16-candle power instead of using cannel coal for this purpose. The gas, after being measured, was passed through the enriching apparatus, and thence to the Argand burner of the photometer. The liquid of which the light-giving value was being determined was added uniformly during the test, which generally lasted half an hour. The quantity of the liquid required to give a certain improvement to the gas was measured from a burette. A Methven 2-candle screen replaced the ordinary candles, so as to avoid trouble with the latter during the testing process. Working in this way with the apparatus, it was found that 1 gallon of pure benzol gave an improvement of 1 candle on 13,300 cubic feet; of commercial benzol, 12,500 cubic feet; of carburine (.680 sp. gr.), 5,700 cubic feet, and of common petroleum spirit (.700 sp. gr.), 4,300 cubic feet. Mr. Stenhouse stated that he found benzol to be the best and cheapest enricher, and that in using it on a large scale there was nothing to fear from condensation, as 1 cubic foot of gas is capable of permanently retaining upwards of 50 grains of benzol vapor, even at a temperature of 32° F.

The Market for Gas Securities.

The market for Consolidated gas is a bit slow, but the people who are dealing in it are somewhat slower than the market. There is no more competition between the Equitable and the Consolidated, which rather shows that Mr. Jerzmanowski has been taught his lesson. We advise the purchase of Consolidated, just as we have been advising that purchase since April 1st. The argument may be somewhat incoherent, but the facts will cohere very much better than the argument; for Consolidated should be a purchase—and a big one—on the simple story told. Some predictions suggest a possible consolidation of all the gas interests of Brooklyn and New York, and more than that we may not say. Chicago gas reflects, as well as anything can, the knowledge that these shares are coming into good and clean hands—those who are not so much involved in speculation *per se* as the men who formerly juggled the shares. Bay States are slow, Lacledes are better, and the general market is away in favor of the investor.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

MAY 27.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	144½	145
Central	500,000	50	140	..
" Scrip	220,000	..	100	..
Equitable	4,000,000	100	196	..
Bonds, 6's	1,000,000	1,000	..	..
" 1st Con. 5's	2,300,000	1,000	111	112
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	168	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	.
Northern	150,000	50	..	..
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	29	..
Preferred	2,000,000	100	49	..
Bonds	3,500,000	1,000	88	89
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	..	..	..
Standard	5,000,000	100	58	56
Preferred	5,000,000	100	101	102
Bonds, 1st Mortgage, 5's	1,500,000	..	105	106
Yonkers	.....	50	101x	.
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	..
Citizens	1,200,000	20	65	..
" S. F. Bonds	320,000	1,000	..	101
Equity	2,000,000	10	..	..
" Bonds	1,000,000	..	..	..
Fulton-Municipal	3,000,000	100	175	..
" Bonds	300,000	..	108	..
Peoples	1,000,000	10	90	.
" Bonds, 7's	368,000	..	100	..
" " 6's	94,000	..	98	100
Metropolitan	870,000	100	170	..
" Bonds, 5's	70,000	..	..	..
Nassau	1,000,000	25	200	..
" Ctfs.	700,000	1,000	99	100
Williamsburgh	1,000,000	50	200	..
" Bonds	1,000,000	..	107	110
Out-of-Town Companies.				
Bay State	5,000,000	15	21¾	22¼
" Income Bonds	2,000,000	1,000	31	31½
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	75¾	77
2d " " "	3,000,000	1,000	55	57
Buffalo Mutual	750,000	100	120	..
" Bonds	200,000	1,000	95	100
Chicago Gas Co.	25,000,000	100	74⅝	74½
Chicago Gas Lt. & Coke Co.				
Guaranteed Gold Bonds	7,650,000	1,000	93	93½
Columbus	1,069,000	..	..	..
1st Mortgage	1,085,000	..	..	..
Consumers, Jersey City	2,000,000	100	74	..
" Bonds	600,000	1,000	97	99½
Cincinnati G. & C. Co.	7,000,000	100	..	203¾
Consumers, Toronto	1,600,000	50	184½	187
Central, San Francisco	.....	..	90	100
Capital, Sacramento	.....	..	..	50
Consolidated, Baltimore	11,000,000	100	61½	62
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	29	..
" Con. Bonds	4,312,000	..	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	74¼	76¾
" Bonds	2,000,000	..	83	84½
Hartford	750,000	25	130	138
Indianapolis	2,000,000	..	140	143
" Bonds, 6's	2,650,000	..	102	..
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	85½	87
Bonds	1,000,000	1,000	85	89½
Louisville	2,370,000	50	..	130
Laclede, St. Louis	7,500,000	100	30¾	32
Preferred	2,500,000	100	91	93
Bonds	9,034,400	1,000	95½	96
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	208
New Haven	.....	25	200	..
Oakland, Cal.	.....	..	43½	43
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	81	..
Consolidated 5's	2,000,000	..	87½	90
Syracuse, N. Y.	500,000	25	..	..
San Francisco, Cal.	10,000,000	100	72⅝	72¾
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	57¾	60
Bonds, 5's	3,556,000	..	87	88½
Wilmington, Del.	500,000	50	188	190

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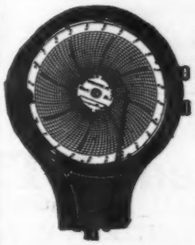

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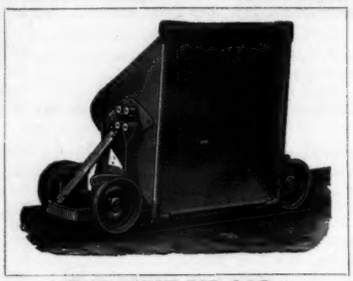

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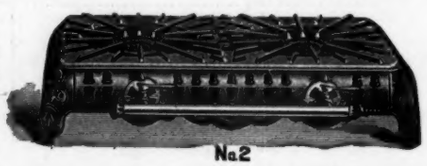

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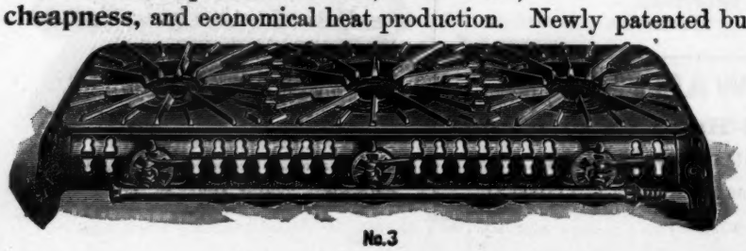

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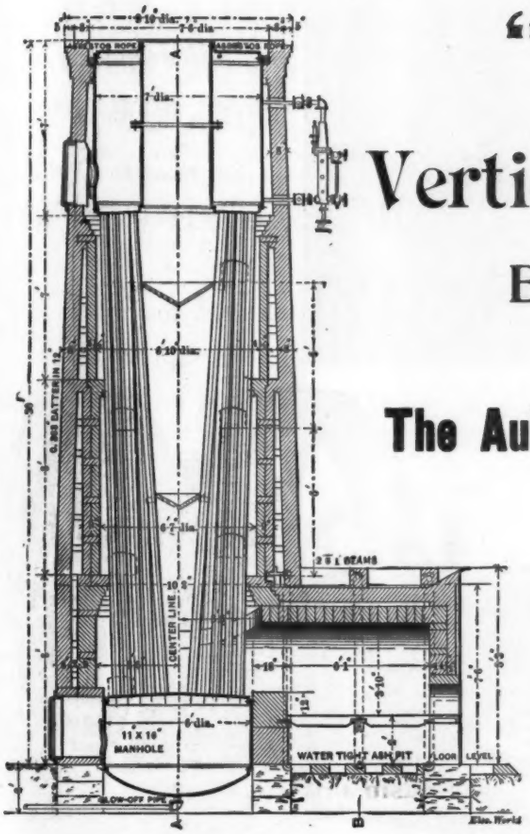

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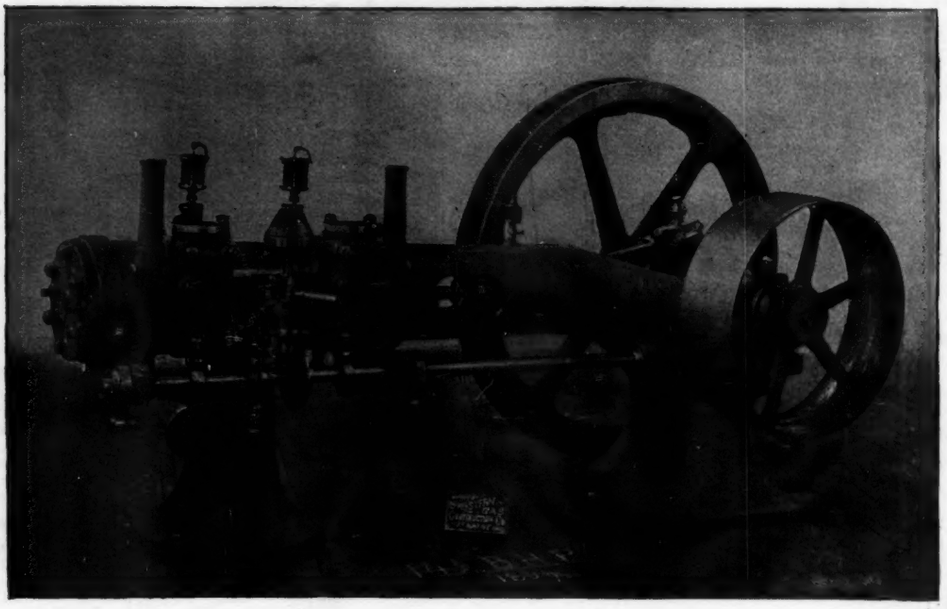

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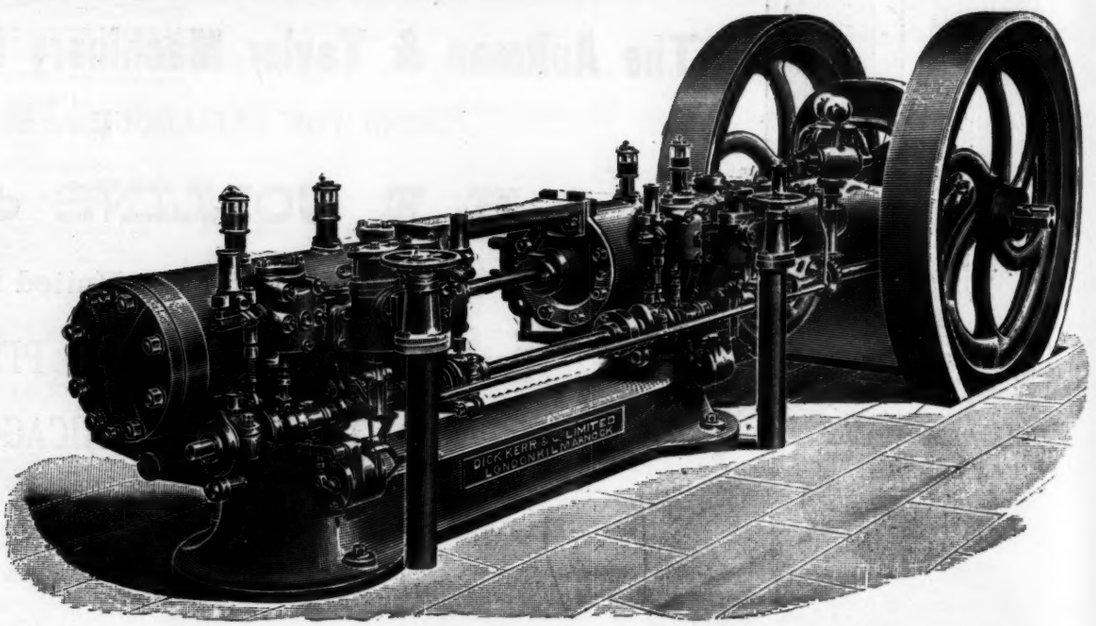

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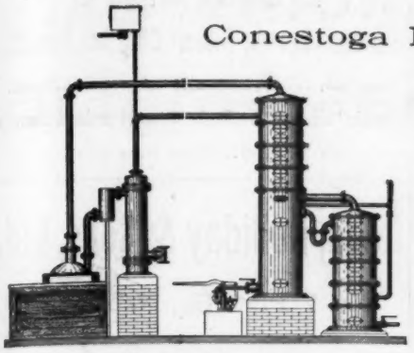

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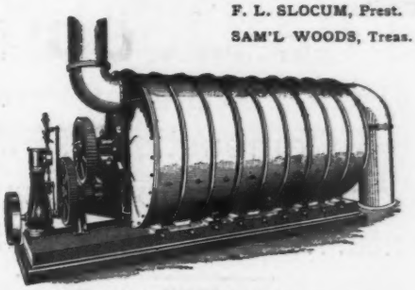

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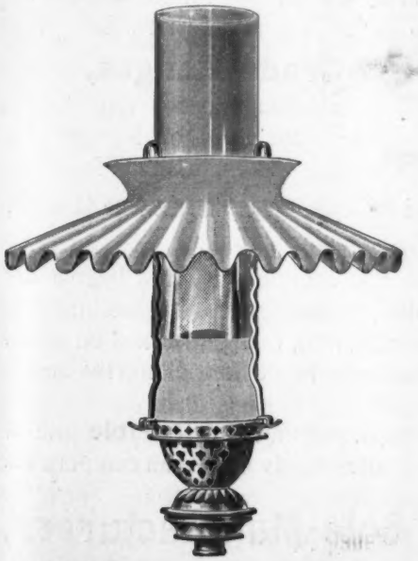

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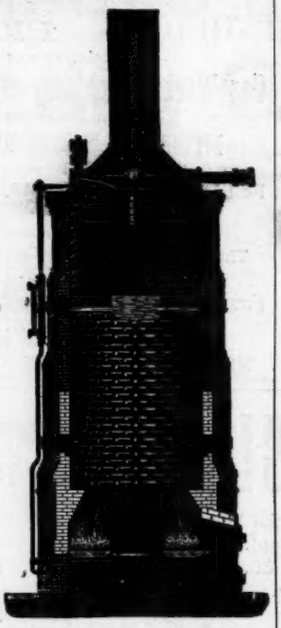

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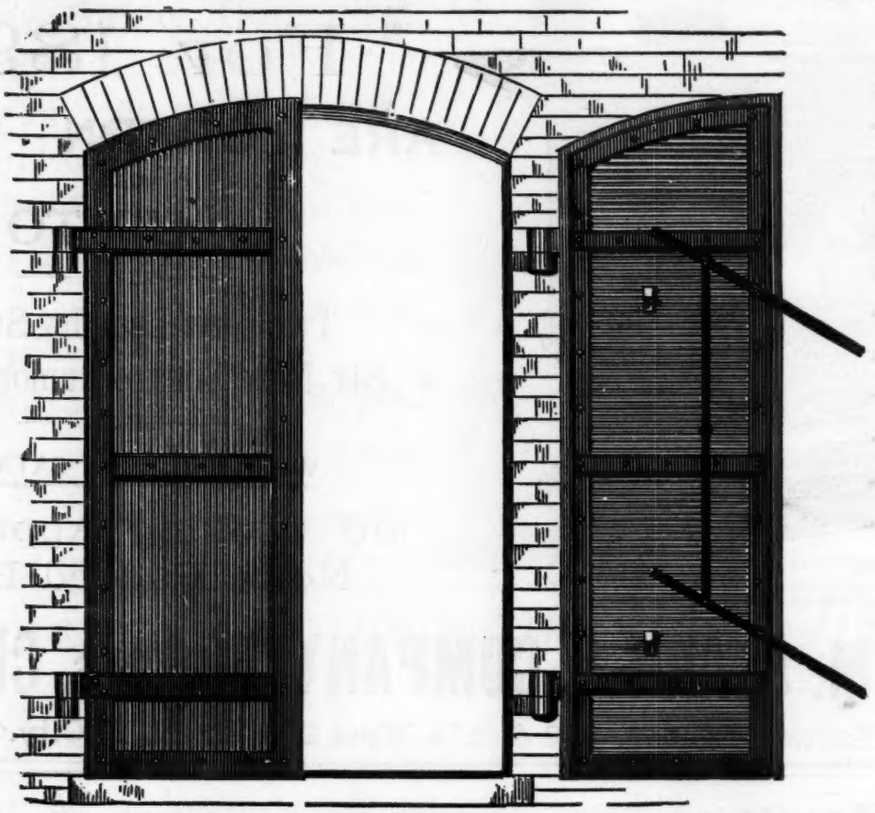

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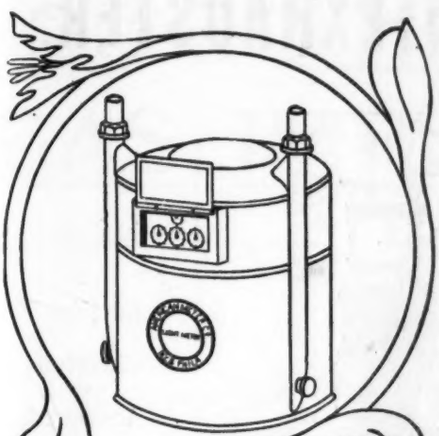

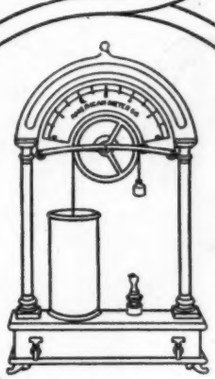

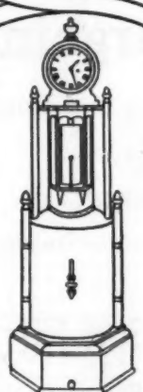

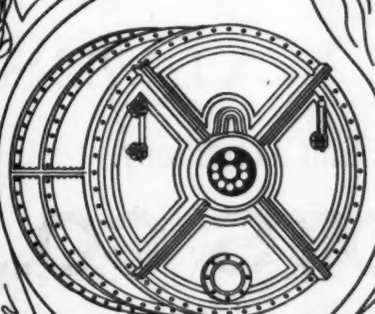

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SAN FRANCISCO.

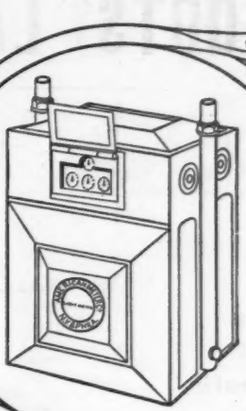
PUBLIC LIGHTING TABLE.

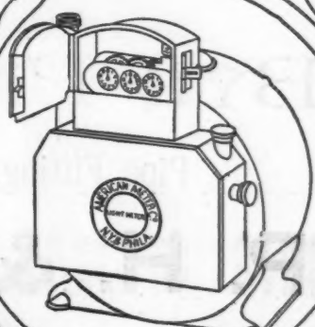
JUNE, 1895.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sat.	1	12 20 AM	3.30 AM	7.15	3.15
Sun.	2	12.50	3.30	7.15	3.15
Mon.	3	1.10	3.30	7.15	3.15
Tue.	4	1.50	3.30	7.25	3.15
Wed.	5	2.20	3.30	7.25	3.15
Thu.	6	No L.	No L.	7.25	3.15
Fri.	7	No L. FM	No L.	7.25	3.15
Sat.	8	No L.	No L.	7.25	3.15
Sun.	9	8.00 PM	10.50 PM	7.25	3.15
Mon.	10	8.00	11.30	7.25	3.15
Tue.	11	8.00	12.00 AM	7.25	3.15
Wed.	12	8.00	12.20	7.25	3.15
Thu.	13	8.00	12.40	7.25	3.15
Fri.	14	8.00	1.00	7.25	3.15
Sat.	15	8.00 LQ	1.20	7.25	3.15
Sun.	16	8.00	1.40	7.25	3.15
Mon.	17	8.00	2.10	7.25	3.15
Tue.	18	8.00	2.30	7.30	3.15
Wed.	19	8.00	3.30	7.30	3.15
Thu.	20	8.00	3.30	7.30	3.15
Fri.	21	8.00	3.30	7.30	3.15
Sat.	22	8.00 NM	3.30	7.30	3.15
Sun.	23	8.00	3.30	7.30	3.15
Mon.	24	8.00	3.30	7.30	3.15
Tue.	25	8.00	3.30	7.30	3.15
Wed.	26	8.00	3.30	7.30	3.15
Thu.	27	10.10	3.30	7.30	3.15
Fri.	28	10.30	3.30	7.30	3.15
Sat.	29	10.50 FQ	3.30	7.30	3.15
Sun.	30	11.20	3.40	7.30	3.15

TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146 30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr.	2161.20	Total, yr.	3987.45





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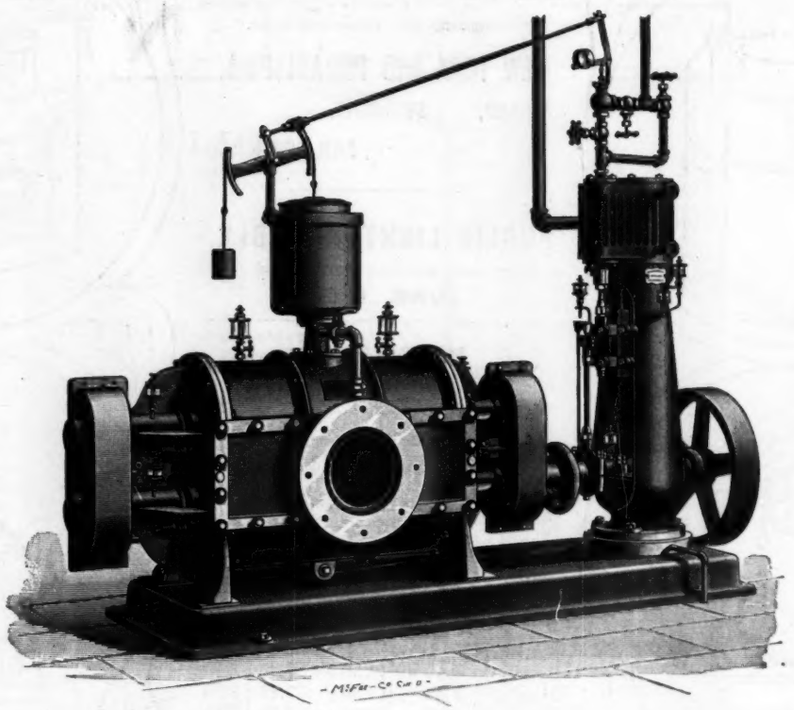

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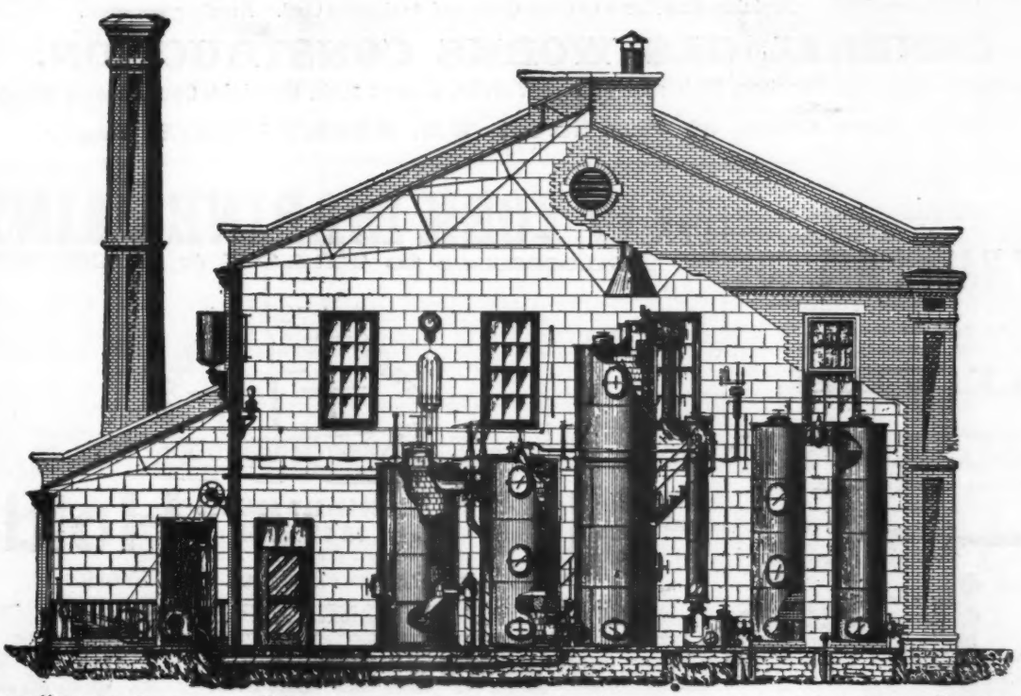

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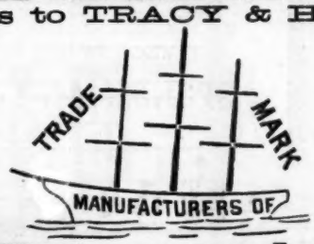

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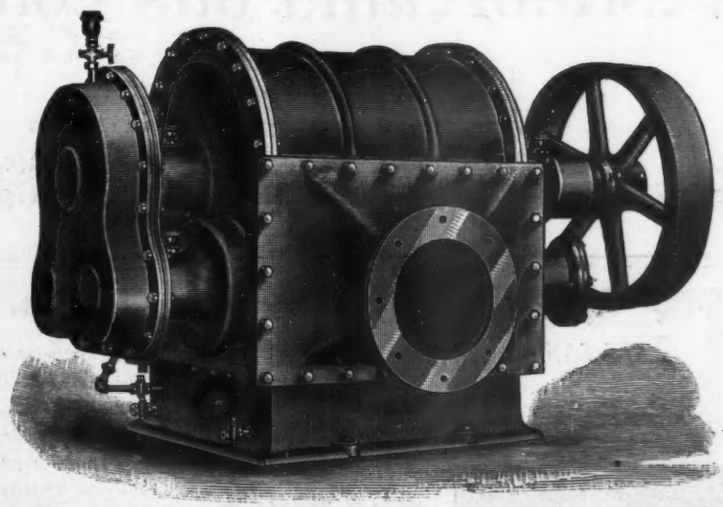

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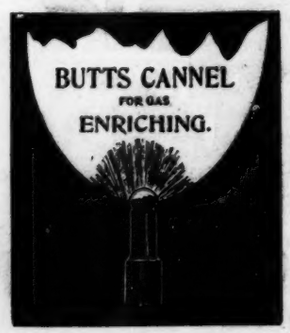

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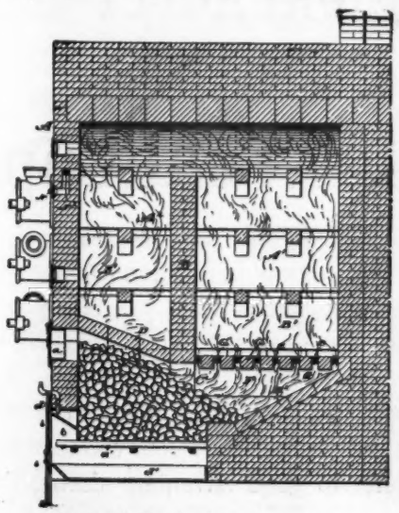

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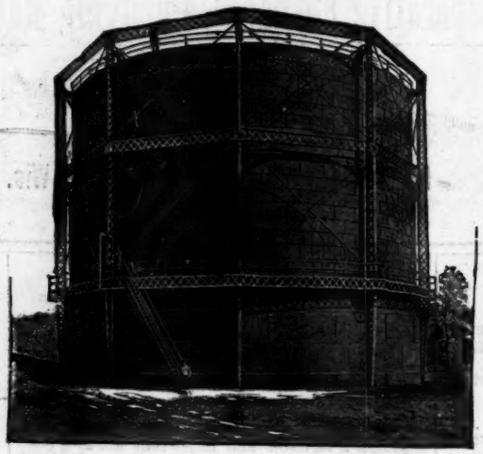

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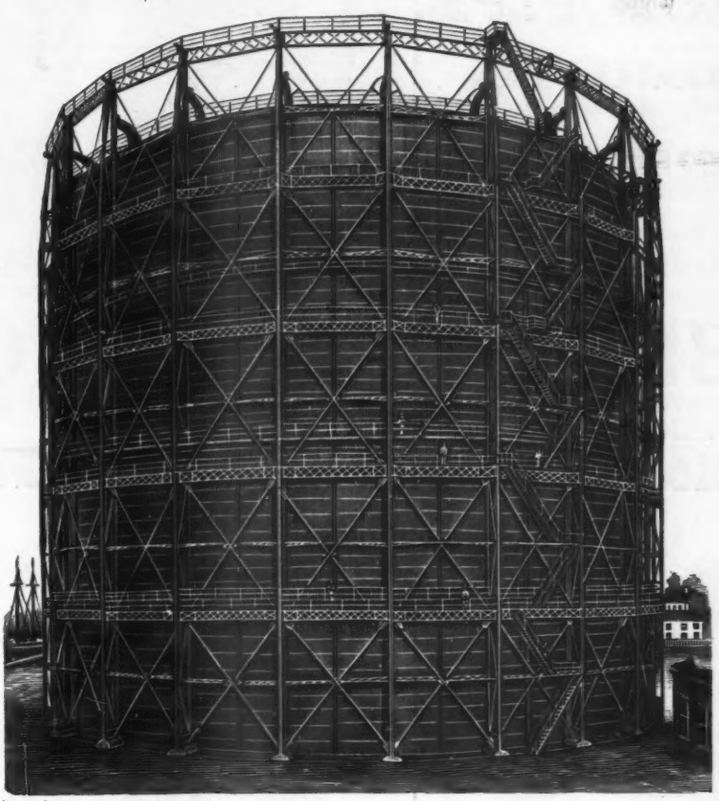

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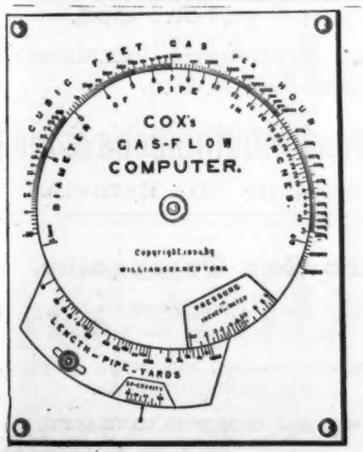

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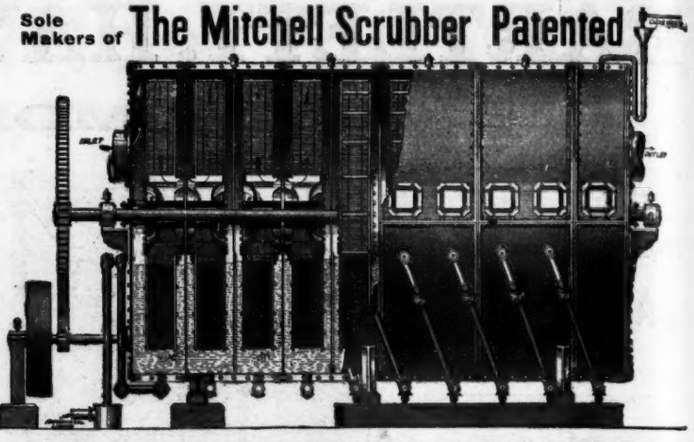

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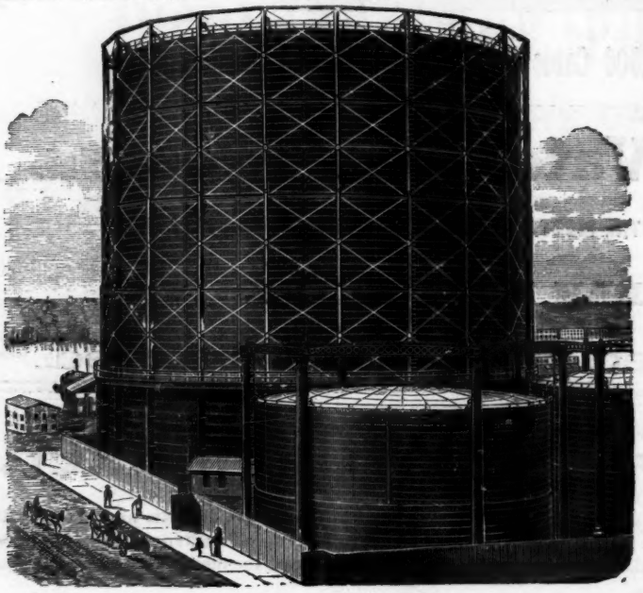

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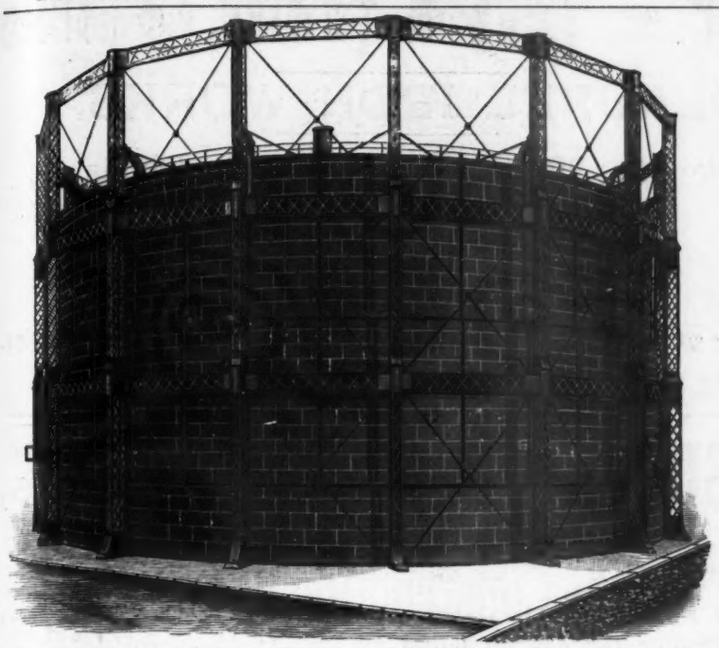

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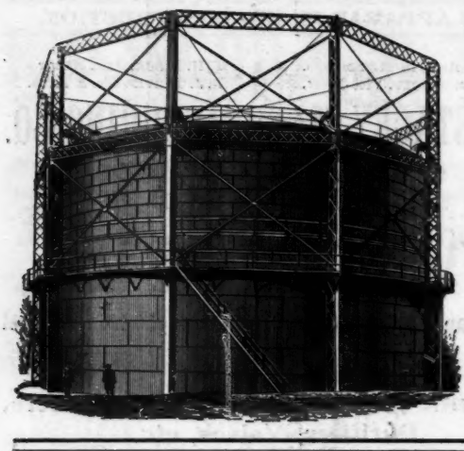

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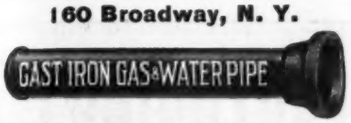

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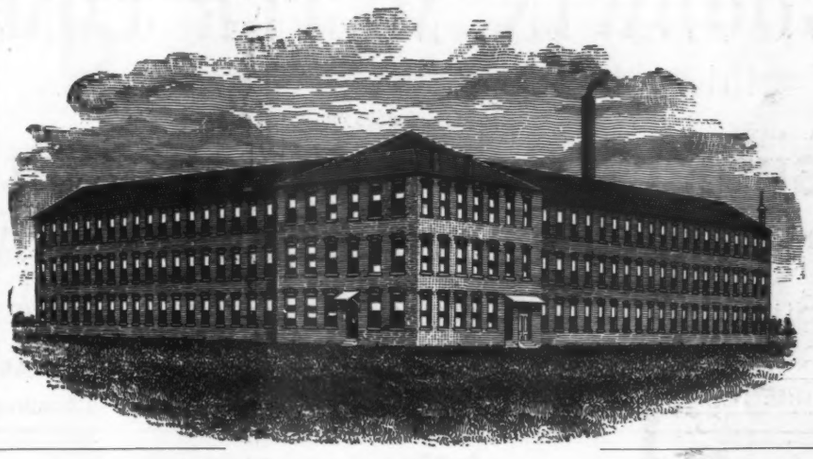

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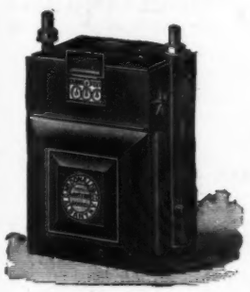

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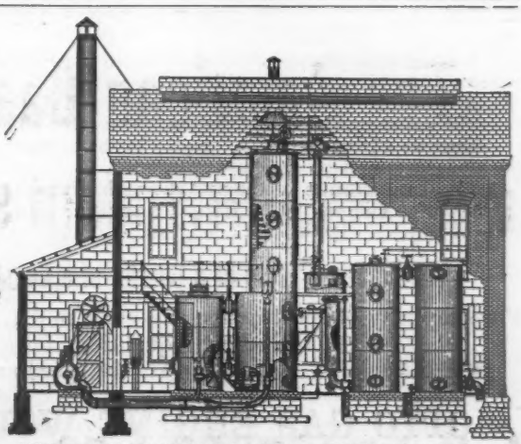

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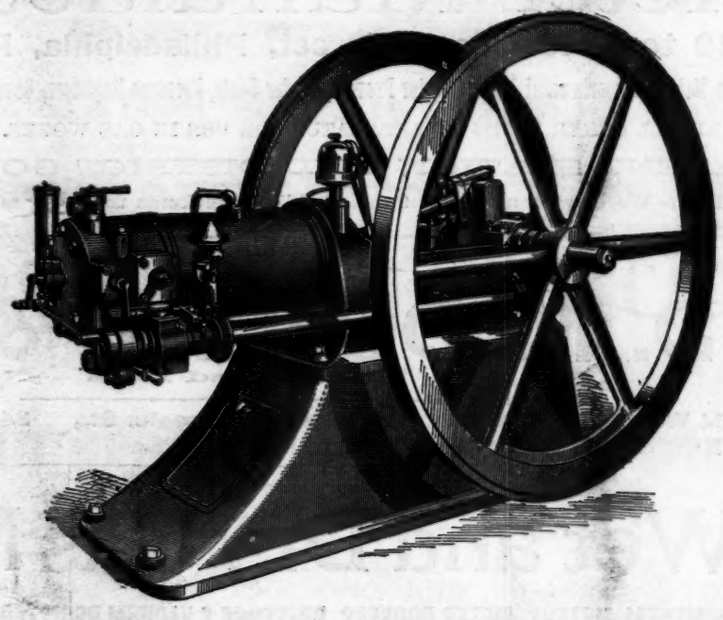

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